ABSTRACT

Title of Dissertation:	SURVIVING THE STORM: AN INTERSECTIONAL ANALYSIS OF HURRICANE KATRINA'S EFFECT ON LINGERING PHYSICAL AND MENTAL HEALTH DISPARITIES
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This three-paper dissertation used an intersectional analytical framework to examine disparities in physical health and mental health (respectively) for Hurricane Katrina survivors by race and gender. To do so, health outcomes for New Orleans residents who survived Hurricane Katrina were analyzed. Displaced New Orleans Resident Survey (DNORS) data was used to investigate if natural disasters exacerbate health disparities. In Chapter 2, eight waves of self-reported data from the nationally-representative Panel Study of Income Dynamics (PSID) were used to conduct a sensitivity analysis of self-reported diagnoses. This was done to determine if there are differences by race and sex in the accuracy of self-reports. Chapter 2's analysis indicates that the intersections of race and sex were not associated with reporting variability after accounting for proxy status and class related characteristics. In Chapters 3 and 4, we determine if significant increases to physical and mental health

diagnosis vary by race and sex, following Hurricane Katrina. The main finding of Chapter 3 was that Black women were more likely to report negative physical health outcomes than their White or male counterparts, both before and after Hurricane Katrina. Chapter 4's main finding was that Black women were not more likely to report a diagnosis of negative emotional problem and depression post-Katrina when compared to their White or male counterparts. There were increased adverse mental health outcomes across all four race-sex groups.

SURVIVING THE STORM: AN INTERSECTIONAL ANALYSIS OF HURRICANE KATRINA'S EFFECT ON PHYSICAL AND MENTAL HEALTH DISPARITIES

by

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Dedication

I dedicate this dissertation to my family, colleagues and friends.

I am ever thankful for my loving mother, Tawana Jacobs, whose support and encouragement have been integral to the completion of this research. I express my sincere gratitude to my daughters, Amn. Celeste DeLoatch and Zoe DeLoatch, whom I adore. They have consistently motivated me and provided me the will to accomplish my goals. I very much appreciate my brother MSgt. Leo DeLoatch, for his strength and support which have helped me endure.

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Chapter 1: Intersectional Health Disparities: The Case of Hurricane Katrina

Abstract

The first paper examines diseased and diagnosed versus diseased and undiagnosed disparities in order to illuminate the ways in which disease prevalence and health outcomes manifest. Additionally, this research will provide a review of the literature related to factors that may have contributed to Hurricane Katrina survivors[1] differences in disease diagnosis before Katrina, as well as explore possible socio-environmental factors that might have affected post-Katrina rates of disease diagnosis. **The second paper compares** PSID differences in inconsistent self-reports of hypertension, diabetes and psychological problem diagnosis overtime, by race and sex, in order to examine the validity of self-reports. **The third paper compares** differences in rates of self-reported hypertension and diabetes diagnosis by race and gender, pre and post Hurricane Katrina, after controlling for demographic variables, income, and injury factors that often strongly correlate with health patterns. **The fourth paper compares** differences in rates of self-reported emotional problem and depression diagnoses by race and gender, pre and post Hurricane Katrina. Individuals and families in New Orleans not only endured the destruction of their physical property, but also were subject to immediate physical injury, caused directly or indirectly by the storm. Yet, the effects of

[1] This study will only include Hurricane Katrina Survivors and exclude the deceased. Only Hurricane Katrina survivors' health outcomes will be assessed.

this acute stress on inflammatory disease response has been characteristically under researched in socially vulnerable groups.

According to the Office of Coastal Management's National Oceanic and Atmospheric Administration, Hurricane Katrina (2005) caused an estimated 161 billion dollars of damage, Hurricane Sandy (2012) caused an estimated 70.2 billion dollars of damage, and Hurricanes Harvey, Maria and Irma (2017) caused an estimated 125, 90 and 50 billion dollars of damage respectively. Natural disasters, like hurricanes, have a significant impact on economic, environmental and social spheres of life. Their damage can affect the short- and long-term health outcomes of disaster survivors. The poor and racial minorities often live in environmentally vulnerable geographic areas- like coastal regions- that experience catastrophic destruction. Those who initially survive, may suffer displacement and lingering physical and mental health effects. Current research has provided us with a glimpse of how the body or the mind is initially affected by environmental catastrophes, but long-term health outcomes need more study. Thus, the role of how the socially constructed categories of race and sex and the intersectional or mutually reinforcing patterns of racism and sexism on health disparities after disasters have been overlooked. To conclude, this research seeks a better understanding of the interconnections between disaster events and the mental and physical health outcomes to expand our knowledge of factors that exacerbate race-sex health disparities.

Introduction

Hurricane Katrina, New Orleans and Displacement

This research investigates variations in physical health (hypertension and diabetes diagnoses) and mental health (emotional problem and depression diagnoses) among Hurricane Katrina survivors. Racial differences in measures of physical and mental health outcomes between Black and White survivors of Katrina will be the primary focus of this study. We will examine how evacuees and/or displaced survivors may exhibit differences in the diagnosis of negative health outcomes one to six years before versus one to six years (1999-2004 vs. 2005-2010) after Katrina's devastation to New Orleans, in order to learn the effect that this event had on health outcomes. To do so, socioeconomic and demographic variables will be used in these multinomial logistic regression analyses to control for heterogeneity within the population of survivors, so that we may focus on the within population variation in health diagnoses.

The bulk of this research will consist of four separate but interrelated dissertation chapters. This first chapter will provide a general overview of this dissertation research. It will begin with a discussion of the Hurricane Katrina, which will then be followed by a general introduction to the disaster literature, an introduction to the intersectional theoretical frame work, a brief discussion of the multinomial logistic regression analytical methodology, as well as a general overview of the Displaced New Orleans Resident Survey (DNORS)

data (Peterson, Sastry, Rendall, Ghosh-Dastidar, and Gregory, 2016). For Hurricane Katrina Survivors surveyed by the DNORS, the third chapter will examine physical health differences, the fourth chapter will examine mental health differences. The second chapter is different, it will investigate mental and physical health self-reporting consistency patterns in the Panel Study of Income Dynamics before and after Katrina. By doing so, this study makes theoretical and empirical contributions to the literature not only because Hurricane Katrina offers a unique opportunity (a natural experiment) for empirical investigation of the disparities in self-reported disease diagnosis, among people who were affected by this ecological catastrophe. This research also will synthesize mental and physical health disparities within an intersectional framework- of which there is currently a dearth of research.

Hurricane Katrina, New Orleans and Displacement

On August 29, 2005, one of the most devastating hurricanes in U.S. History shattered the lives of Gulf Coast residents, and added layers of suffering for those who already lived in economically depressed areas of New Orleans (U.S. Department of Commerce 2006). Hurricane Katrina caused flooding of over 80 percent of New Orleans after the levees failed, 86 percent of the almost 1,600 deaths from Hurricane Katrina occurred in Louisiana alone (Brunkard, Namulanda, Ratard 2008; Roth 2010). Hurricane Katrina not only killed people, it also displaced residents which negatively impacted the population of New Orleans. According to the Greater New Orleans Community Data Center (GNOCDC), the population of New Orleans

decreased by about 50 percent, or from an estimated 484,674 people pre-Katrina (2002) to 208,548 post-Katrina (2006). The GNOCDC also found that as of April 2010, the population increased to about 71 percent of its Pre-Katrina size or to 343,829 people. FEMA estimates that over $100 billion of damage was caused by this catastrophic event (Dolfman, Wasser, & Bergman 2007).

New Orleans is the largest city in the State of Louisiana and is a major port located south of the Mississippi River and north of Lake Pontchartrain (Elliott and Pais 2006). The city is geographically predisposed to severe flooding from the Mississippi River, coastal storms, and heavy precipitation because New Orleans is located below sea level and lacks natural drainage (Carter 2005). The City of New Orleans was so negatively impacted by Hurricane Katrina because of its geographical location. According to Leatherman and Burkett (2002), New Orleans was not only built on the lowest elevation in the state of Louisiana, it is also one of the lowest elevations (.3 and 3 m below sea level) in the United States. According to Weisler et al. (2006), when Hurricane Katrina emptied its bellows of destruction on the Gulf Coast, in geographical terms, a land mass about the size of Great Britain (about 90,000 square miles), was declared a federal disaster area by FEMA. Residents and cleanup workers were faced with the challenge of being surrounded by contaminated flood waters-mixed with raw sewage, bacteria, millions of gallons of oil, heavy metals, pesticides, and toxic chemicals.

In addition to its geographical location, a combination of environmental factors has increased New Orleans' susceptibility to flooding. Hurricanes have increased in prevalence and intensity within the past decade, and within the past century the 1947 Hurricane, Hurricane Betsy in 1965, Hurricane Camille in 1969, and Hurricane Katrina that destroyed the Gulf Coast in 2005- indicate that this may be an ecologically vulnerable area (Parker, Stern, Paglia, and Brown 2009). Another factor is the gradual loss of elevation due to the erosion of surrounding wetlands which has been exacerbated by accelerated or rising sea levels (Masozera, Bailey, and Kerchner 2007). Because of the city's low elevation, it is protected by a series of levees. Levees were built by the oldest parts of the city, close to the shores of the Mississippi river, and lower elevation neighborhoods were settled mainly by Blacks as the city developed (Dyson 2006; Leatherman and Burkett 2002; Spain 1979). When the levees failed and the Mississippi river flooded the parishes (counties) of the Greater New Orleans area, poor Blacks were forced to bear the brunt of the storm because to their disadvantage, they were strategically located within this geographically vulnerable area (Congleton 2006; Dellinger 2014; Fussell, Sastry & VanLandingham 2010; Geaghan 2011; Sharkey 2007).

Due to adverse socioeconomic conditions, Katrina caused property damage and forced some of the most socially vulnerable people in this cultural mecca- predominately poor, urban Blacks to become permanently displaced (Groen &

Polivka 2008; Sharkey 2007). Even before Hurricane Katrina's damage, New Orleans was characterized by high poverty rates and low-wage jobs (Danziger & Danziger 2006, Landphair 2007). According to Strolovitch, Warren and Frymer (2006), of those who faced the devastation of Katrina, the following alarming demographic statistics emerged: 67 percent were Black, 28 percent lived below the poverty line and of those who lived below the poverty line, 84 percent were Black. They also estimated that 100,000 people did not have access to a car, which ultimately impeded their ability to move to safety before the hurricane. According to the Center for Progressive Reform (2005), New Orleans had a poverty rate more than twice the national average which made it one of the nation's poorest cities.

Disaster, Social Vulnerability and Health Disparities

Disaster

Disaster events impact the environment, economies and human beings in highly complex ways. Yet, arguably disaster events exacerbate and crystalize preexisting social inequalities. According to Fothergill et al. (1999), the disaster literature commonly focuses on eight stages of disaster: risk perception; preparedness behavior; warning communication and response; physical impacts; psychological impacts; emergency response; recovery; and finally, reconstruction. Though these researchers propose eight stages of disaster, this dissertation research is narrower in scope. It will focus on the physical (Chapter 3) and psychological (Chapter 4) impacts to disaster victims. We will use an intersectional analytical framework to illuminate the

ways in which disaster events may exacerbate and grow preexisting social inequalities. To do so, pre and post-Hurricane Katrina racial and sex disparities in survivor's physical (hypertension and diabetes) and mental (emotional problem and depression) health outcomes will be analyzed.

Disasters may be categorized in a variety of ways and Ford, Mokdad, Link, Garvin, and McGuire (2006) defined Hurricane Katrina as a *consensus-type crises*[2] according to Quarantelli's (1993) disaster typology-which is a natural disaster with a relatively sudden appearance and definable area of impact. Also, because of the increased prevalence of ecological disasters and the resulting environmental devastation that emanates from these events, research has paid more attention to how disaster exposure affects mental and physical health outcomes (Rhodes, Chan, Waters, Rouse and Fussell 2010). They found that research focuses on either short term or long term implications. For research that focused on short term implications, it indicated that disaster survivors often exhibit the symptoms of posttraumatic stress disorder (PTSD), depression, anxiety, somatization, substance abuse, and physical illness. Whereas long-term physical and mental health findings provided evidence that people often suffered enduring effects (Green 1993; Weisler, Barbee, and

[2] Though most scholars have agreed that Katrina was a catastrophic event (Quarantelli 2006), there is some variance or discontinuity in how various agencies or disciplines label Katrina's environmental impact. Some label the hurricane a disaster (Ford, Mokdad, Link, Garvin, and McGuire 2006) while others label it a crisis (Reuveny 2007).

Townsend 2006; Ford, Mokdad, Link, Garvin, & McGuire 2006). Rubonis and Bickman's (1991) meta- analysis of 52 disaster studies did not find support for these findings though, instead they discovered that rates and diagnosis of illness dissipated with time.

Fothergill et al. (1999), created a useful analytical framework that offered a way to integrate how racism, vulnerability and economic power reinforce one another in the disaster context. They framed their analysis using a disaster as 'social' event approach- after which other disaster experts (and this research) implicitly followed suit (Geaghan 2011; Yarnal 2007). At first, they set out to synthesize research on racial/ethnic differences in vulnerability, but found so much heterogeneity amongst research linked to socio-historical variability at the time of disaster events, that patterns scarcely emerged. Yet, there was one pattern that emerged from their meta-analysis: that low status ethnic/racial groups were more likely to suffer from mental and physical health problems after environmental disasters occurred.

Social Vulnerability and Weathering

"In the public imagination, natural disasters do not discriminate, but are instead "equal opportunity" calamities. Hurricanes may not single out victims by their race, class, or gender, but neither do such disasters occur in historical, political, social, or economic vacuums. Instead, the consequences of such catastrophes replicate and exacerbate the effects of extant inequalities, and often bring into stark relief the importance of political

institutions, processes, ideologies, and norms." (Strolovitch, Warren, and Frymer 2006:1)

The above statement made by Strolovitch et al. (2006) can be heard as a call to uncover how vulnerability shapes disaster health outcomes within an affected population since existing inequalities are dangerously exacerbated by catastrophes. They call attention to the amplification of social ills that often go undiagnosed or are not researched due to the seemingly haphazard way 'natural' disasters destroy the environment- which then may not allow them to become framed as a complex social problem by researchers. The illumination of this underexplored process substantiates the premise behind this research, which arguably points out that disasters not only compound the dynamic effects of reinforcing oppressions experienced by those who inhabit the intersections of race, gender and class, but that these forces get beneath the skin and permeate into the mind and body. Because of the racially diverse population who inhabit the New Orleans area, the destructive environmental forces of Hurricane Katrina provide an excellent case study to examine how racialized and gendered health inequalities become exacerbated by a catastrophe.

Environmental destruction disproportionately and negatively affects marginalized groups in society when compared to groups who hold social, economic, and political power (Donner and Rodriguez 2008). Schmidtlein,

Deutsch, Piegorsch, Cutter (2008:1100) define vulnerability as the “likelihood of sustaining losses from some actual or potential hazard event, as well as the ability to recover from those losses." Researchers have found that low social status increases social vulnerability to disaster. For example, following Hurricane Katrina, women were a socially vulnerable group who not only suffered from displacement, but were also vastly over-represented in New Orleans’ shelters as a result (Laska and Morrow 2006). These displaced women were more likely to be primary caregivers for their children, live below the poverty line and be Black (Enarson 2006). Not only did these women endure and survive the storm, but once they were safe from the destructive forces of nature, they had still had to face the common challenges of mothering with the added stress of mothering their children while displaced (Laska and Morrow 2006). Yet, according to Strolovitch et al. (2006) even though media images were saturated with displaced Black New Orleanians, President Bush initially resisted acknowledging the disproportionate impact of Katrina on low-income and Black residents of New Orleans. After visiting the area, even he eventually became compelled enough to recognize “the legacy of inequality (cited by Strolovitch et al. (2006:2).” During this time of catastrophe, the centrality of racial stratification in America became omnipresent. Kanye West called out for political attention to the displacement of Black people by declaring that “George Bush doesn’t care about Black people (cited by Strolovitch et al. (2006:5).”

Social vulnerability is also shaped by inequalities in who lives where. Unequal impacts in who was forced to weather the storm may also have been due to housing factors. According to Bolton et al. (1993), Blacks and Hispanics in the US are more likely to live in apartment buildings that are often older and contain unreinforced masonry (URM) that is more likely than not to be damaged in a disaster. Dash Peacock and Morrow (1997) also argue that structural damage is related to race and ethnicity because of segregated residential patterns and the economic restraints on safe construction. Bolin and Bolton (1986) found evidence that in a Texas (Paris) tornado, damage levels were directly related to race. They found that Blacks, were more likely to own older or poorly built homes, which resulted in them sustaining higher levels of physical damage (even though the cost of repairs would be lower) when compared to Whites.

Weathering

Not only is there a demonstrated need for an integrative vulnerability scientific approach to hazard research (see Cutter 2003), but understanding how vulnerability is informed by weathering (the cumulative burden of adverse psychosocial and economic circumstances on the bodies of minority women) is also needed in epidemiologic studies. According to Love, Rankin et al. (2010), weathering has been applied to document the rapidly increasing risks of adverse birth outcomes for Black women. They argue that race and class should be disaggregated, because it is then that the inequality as a result of the

weathering experience of Black women becomes extremely visible. Some studies have found that class is a mediating factor, since adverse birth outcomes as Black women increase in age become more similar to those of their White counterparts (Geronimus et al. 2006). The concept of weathering will be used to frame the chronic stress response that might have influenced health outcomes for those who survived the acute stress caused by Hurricane Katina.

Theoretical & Conceptual Framework

Status, Stigma & Intersectionality

Three key theoretical frameworks will inform this dissertation research. First, to help us understand how external forces shape the disease process, status syndrome theory (SST) will be used. SST enables us to make predictions about how external social forces might affect mental and physical health outcomes. Next, status characteristics theory (SCT) will be used to help frame our understanding of how stress is internalized and shape our predictions about the process of stigmatization to analyze physical health disparities between Black and White New Orleanians who survived Hurricane Katrina. Most importantly, these theories will be placed into articulation with one another using an intersectional analytical framework. This articulation will allow us to uncover patterns shaped by the concurrent and overarching forces of racial and

gender oppression as well as the resulting external and internal forces that shape health disparity.

Arguably, autonomy can provide most of us with a sense of interpersonal strength, a strong sense of self efficacy and a sense of control over our lives. For example, studies have found that increased autonomy is associated with a higher life expectancy (Crimmins and Saito 2001; Kochanek et al. 2014; Veenhoven 1996; Yang 2008), or more simply, people live longer lives when they feel personally empowered. But, what happens when autonomy is chronically reduced for an individual or a group of people? Michael Marmot (2006), a Professor of Epidemiology and Public Health and Director of the International Centre for Health and Society at University College London (UCL), created a theory- Status Syndrome Theory- that helps explain how social forces (like reduced autonomy or increased social control) shape disease formation.

SST emerged after Marmot researched White collar workers for thirty years. Marmot consistently found that workers with low social status were more likely to report a reduction in the ability to exercise their autonomy, and these same workers were also more likely to report poor health markers. Marmot called this phenomena status syndrome and argued that class systematically organized people's health outcomes. Consequently, status syndrome theory is particularly useful theory to help guide this research, since it directly

articulates how one's external social condition informs her/his internal health condition. SST allows researchers to answer questions like those addressed in this research and may provide us with tool to help predict and eventually explain differences in health outcomes for Hurricane Katrina survivors.

Population health problems, and chronic disease formation disparity for marginalized groups, could also be better understood through a stigma-status theoretical framework- SCT (Seeman, Karlamangla, Koretz, & Seeman 2014). Yet, because stigma and status processes have been conceptually separated or siloed in the field of Sociology, both their theoretical usefulness and analytical application have been reduced (Phelan, Lucas, Ridgeway & Taylor 2013). The strength of status characteristics theory is that it explains how stigma and status are mutually reinforcing processes. Furthermore, SCT addresses how social ordering schemas create social status and stigma differences- this in turn may shape the disease process and lead to negative health outcomes for the socially vulnerable (Phelan, Lucas, Ridgeway & Taylor 2013; Schafer 2011; Lykke 2011).

Most simply, SCT allows us to describe and make predictions about the internalization of stigma related stressors (both acute and chronic). For example, people who are marginalized by race, gender and/or class groups may experience overt or covert microaggressions in their external environment, but then how they respond internally from the resulting

stigmatization that they experience, could subsequently create macro level (society wide) health disparities. Uniquely, this research will embed SCT within an intersectional framework to further our understanding of how personal disempowerment might increase pathogenesis (Lykke 2011; Phelan, Lucas, Ridgeway & Taylor 2013).

Intersectionality contributes to the development of this analytical framework since it is a robust approach- used to illuminate the social context in which Katrina survivor's disparate physical and mental health problems may develop and emerge. Intersectionality also becomes a critical aspect of this research lens, since intersectional work is an extensive body of scholarship that attempts to examine and address the treatment of the oppressed- Black women more specifically and women of color more generally- in social science research (Collins 2000). Intersectionality allows us to develop a more rigorous theoretical framework since it is both an idea and an ideograph (Alexander-Floyd 2012).

Intersectionality was developed as an idea or concept used to describe the "intersecting" or interlocking forces of racism, sexism, and classism that dominated Black women's lives (Crenshaw 1989). Yet, because it is an ideographic approach to the construction of knowledge, it is often used to unpack the highly complex and nuanced marginalized group's social experiences (Alexander- Floyd 2012). Since this research will focus on the

disparate health outcomes for Black women who survived Hurricane Katrina, it will need to use an intersectional framework to contextualize how these presumed mental and physical health outcome differences developed within the social microcosm of New Orleans.

The danger of not using an intersectional framework (when theoretically appropriate), is that intellectuals, researchers, theorists, and empiricists often compartmentalize ascribed social statuses like race, class and gender into separate categories that makes invisible the ways in which multiple oppressions reinforce one another (McCall 2005). According to Yuvall-Davis (2006), instead of being treated as overlapping and mutually constructive categories, they are appropriated with finite boundaries and disconnected from sources of power or domination (like the segments of an orange). Yet, this segmented or categorical approach often ignores the interconnectedness of the overarching social constellations of race/class/gender. The rigid boundaries constructed around these intersecting hierarchies (race), social categories (class), and dichotomies (gender) creates the impression that they are static and separate.

More specifically, the stigmatization of these social phenomena (race/class/gender) can be experienced by people simultaneously which is contrary to the prevailing logocentrism and limiting binary logic that dominates the Western intellectual landscape (Collins 2000). For example,

within the segmented system of heteromasculine gender relations, man/male becomes constructed as the universal neutral subject and woman/female as the gendered and sexualized other (McCall 2005). In terms of race, White becomes constructed as the universal neutral subject and Black as the racially stigmatized other. Thus, it relegates the multiply marginalized to the periphery of hegemonic discourses (Collins, 1998). For example, those who experience the interstices of race, class and gender can become disappeared within 'business as usual' academic discourse (Alexander-Floyd, 2012). Therefore, even though sources of oppression have been treated separately, as fixed and 'normal', or compartmentalized- this research will attempt to unify these experiences within an intersectional framework to expose the continuity of imbalanced power relations.

Intersectionality also allows us to unpack the diffuse nature of power and oppression that manifests from social interaction. This perspective will be used to unearth the methods in which multiple oppressions are experienced within the interaction of the overarching social constellations of Race, Gender, and the Class (McCall 2005). Intersectionality allows us to examine the mechanisms of power and oppression that emerge from social relations and power out from these relations within the matrix of domination and contextualize them ideographically (Collins 2000). This is an intentional digging, sorting, and unveiling of how oppression becomes the foundation for the embodiment of disease and creates interlocking patterns of domination

within a particular racial location of American social structure. Intersectionality is used in this analysis to capture the simultaneity between one's socially constructed self and its interaction within mutually constituted systems of oppression (Yuval-Davis 2006). Furthermore, an intersectional approach allows us to peel back the layers of power to expose the interconnectedness of racism, classism, and sexism.

It is further argued here, that in addition to intersecting forms of oppression, the body is a site or a physical domain of oppression, where social objectification can be embodied as disease. The corpus or body remains the primary means through which the external environment is experienced, and this process of embodiment allows the mind to internalize the external social world. Black bodies become racialized, sexualized, and criminalized within this process. In turn, Blacks may experience higher levels of stress from the internalization of racism, and Black women may suffer from even higher levels of stress from the internalization of racism, classism and sexism. Although we may not be able to contextualize a general narrative for the Black experience (either through the lens of masculinity or femininity), using this analysis of Katrina survivors, the influence of chronic psychosocial stressors like racial objectification, sexual discrimination and class based antagonisms on Blacks in the United States should nonetheless be made visible within the acutely stressful event of the hurricane.

Diagnosis Prevalence, Racial Disparity & Healthcare Access

Variable Error: Disease Diagnosis (Incidence) vs. Disease Prevalence

Variable error and bias are principal forms of measurement error. Variable error (variance) tends to be randomly distributed, while bias is an error that systematically skews or polarizes measures (Kasprzyk 2005). Arguably, while variable errors are random, they increase the distribution variability because the overestimation and underestimation of a variable do not just cancel each other out (Statistical Policy Office 2001). For example, when a researcher analyzes rates of disease diagnosis at a particular time in history and the number of people who have hypertension are underestimated by 100, and then at a second point in time overestimated by 100, though the mean number of people diagnosed with hypertension may be accurate, the variability will increase. Then, the error term will significantly affect the testing of the study's analytical outcomes (Scheffé 1999). The error term in an analysis is a very important measure since it can be used to represent within-group variability in parametric tests with increased variance (potentially emanating from reporting errors) (Scheffé 1999). Different research implications arise from analyzing data that have either or even both forms of these measurement errors.

Epidemiologists and social demographers investigate the extent of disease in a population using measures of incidence and prevalence. For example, Ibrahim et al. (1999) contend that incidence measures are limited to new cases in health status or how one's diagnosis changes from non-diseased to diseased.

They also describe how prevalence is more inclusive in that it measures not only the newly diagnosed, but includes the diseased survivors as well. Population studies may favor using an incidence measure, if a disease is spreading quickly within a particular population (e.g. Ebola studies), or choose a prevalence measure for chronic diseases where subjects may survive for a period of time (e.g. hypertension studies) (Barcellos, Goldman, and Smith 2012; Bloche 2001; Van Laar et al. 2007; Mozaffarian et al. 2015).

For example, if we wanted to determine the 2020 incidence of hypertension (or diabetes), then only newly diagnosed cases of hypertension would be in the numerator. If we wanted to know the 2016 prevalence for hypertension outcomes, then recently diagnosed and an estimate of diseased survivors could be in the numerator. A prevalence measure for 2020 hypertension outcomes could also include all diagnosed and estimates for undiagnosed subjects for a period of time divided by all living subjects with hypertension. Figuring out disease prevalence is a complex process and problems with prevalence data exist (Pearce 2004). Because prevalence attempts to measure the frequency of a particular health outcome, some estimates focus on the frequency of diagnosis while other prevalence estimates try to include estimates for those who are diseased but undiagnosed (Ibrahim et al. 1999). Thus, any two estimates of prevalence may not be comparable if they are measuring diagnosed versus undiagnosed prevalence.

Theory on Racial Disparities in Diagnosis of High Blood Pressure and Diabetes

Mitigating the negative effects of diagnosed hypertension costs the United States $131 billion a year, and the American Heart Association (AHA) expects this estimate to double by 2030 (Go et al. 2013). Moreover, according to the American Diabetes Association's (ADA) 2012 estimate of diagnosed diabetes care, the US spent $245 billion, which is a 41 percent increase from the 2007 estimate of $174 billion (Yang et al. 2013). The Institute for Alternative Futures (IAF), using data from the Centers for Disease Control and Prevention (CDC), predicts that the annual cost of diabetes care will rise to $360.5 billion by 2025 (Rowley and Bezold 2012). Heart disease and diabetes place an economic strain on society- especially when the general state of national healthfulness is on the rise (Mozaffarian et al. 2015). Yet, this trend towards healthfulness does not extend to all subgroups with the U.S. population. Patterns of health disparities in incidence and prevalence of disease and death for racial and ethnic minorities have emerged from deeply rooted historical trends, and continue to plague these groups (Bloche 2001; Bosworth and Oddone 2002; Centers for Disease Control and Prevention 2011; Chow et al. 2012; Kell et al. 2015; Kressin et al. 2010; Neal et al. 2006). Arguably, researching states of health and disease is a complex undertaking, and since hypertension and diabetes are chronic inflammatory diseases responses, they are often comorbidities (Barcellos et al. 2012; Kressin et al. 2010). Even

though a person may have both conditions, this analysis will theoretically treat hypertension and diabetes independently.

Hypertension

In 2013, at the Heart Disease and Stroke Statistical Update meeting, the American Heart Association (AHA), Centers for Disease Control and Prevention (CDC) and the National Institutes of Health (NIH) reported that about one in three (77.9 million) US adults have hypertension. But, this reported figure is more than just an estimate of diagnosed cases, it also attempts to capture disease prevalence in the population and includes estimates of those who they figure are currently living with hypertension but remain undiagnosed (Mozaffarian et al. 2015). The 2007-2010 National Health and Nutrition Examination Survey (NHANES) study of heart disease prevalence in the population reported that only 81.5 percent of U.S. adults with hypertension were even aware of their disease prognosis. Therefore, 18.5 percent or an estimated 14.4 million Americans who have hypertension, are unaware of their diagnosis and more importantly they are not receiving medical treatment (Centers for Disease Control and Prevention 2014).

Because hypertension can be asymptomatic, people who do not display symptoms from hypertension may not seek the necessary medical attention that could prevent hypertension induced myocardial infarction, or even heart and renal failure (Bosworth and Oddone 2002; Mozaffarian et al. 2015; Niska

2011; Ong et al. 2007). Research clearly shows that this situation is problematic because undiagnosed hypertension may ultimately lead to death, and deaths resulting from hypertension are increasing even though deaths from heart disease and stroke have decreased by 33 percent from 2001 to 2011 (Mozaffarian et al. 2015). The AHA has declared undiagnosed hypertension a grave public health concern, and the call for more research on undiagnosed hypertension in relation to how it affects our health care system and society was made (Go et al. 2013).

Hypertension is a preceding chronic health condition that can lead to cardiovascular, cerebrovascular, and renal disease (Niska 2011). Population estimates for hypertension are problematic, but an intersectional analysis of racial and sex differences in prevalence brings attention to some alarming disparities. So, for the 77.9 million adults who currently have hypertension (regardless of whether or not they have been diagnosed) only 74.9 percent are actively being treated- and even fewer- 52.5 percent are successfully controlling their hypertension (Go et al. 2013). Accounting for differences by race and gender, the AHA (2013) reported that 33.4 percent of White men and 30.7 percent of White women have hypertension in comparison to the 42.6 percent of Black men and 47.0 percent of Black women have hypertension (Go et al. 2013).

Research on the reasons behind these disparities in health outcomes predicts that racial differences in cardiovascular morbidity and mortality may arise because of the disparity in Black hypertension rates (Bloche 2001; Bosworth and Oddone 2002). Additionally, Kressin et al. (2010) found that Blacks are more likely to have poorly controlled blood pressure even after controlling for comorbidities such as diabetes and renal disease. To make matters worse, by 2030, the AHA predicts that there will be a 7.2 percent increase in hypertension when compared to the 2013 estimates, so there has been a push towards 'aggressive antihypertensive therapy', but a patient needs to know their diagnosed state in order to receive this therapy (Go et al. 2013).

Diabetes Mellitus

Diabetes is a chronic inflammatory disease that can cause debilitating complications like depression, kidney failure, blindness and death (Herman and Cohen 2012; Mokdad et al. 2003, 2003; Resnick et al. 1998). The 2014 CDC National Diabetes Statistics report, using 2013 data, listed diabetes as the seventh leading cause of death (75,578 deaths) (CDC 2014). They also found that diabetes induced deaths were likely underreported because only about 35 percent to 40 percent of diabetics who died had their condition listed on the death certificate. Diabetes can go silently undetected for a long time since it can be asymptomatic (Gregg, Cadwell, and Cheng 2004; Ruderman et al.

1998; Wee et al. 2008a). Many people first become aware that they have diabetes when they develop one of its potentially life-threatening complications, such as heart disease, blindness or nerve disease (Buys et al. 2015; Geronimus et al. 2006; Ong et al. 2007; Ruderman et al. 1998). Using 2012 population estimates, the American Diabetes Association's (ADA) approximates that of the 29.1 million Americans (9.3 percent of the U.S. population) who had diabetes, 8.1 million were undiagnosed. Thus, 27.8 percent of people with diabetes are undiagnosed (Angelica and Fong 2008; Barcellos et al. 2012; Gregg et al. 2004; Rowley and Bezold 2012; Wee et al. 2008b; Yang et al. 2013).

As it relates to race and sex diabetes outcomes, research shows that there are disparities in disease diagnosis by race, gender and morphology (Neal et al. 2006). Zhang, Wang, and Huang (2009) found that the prevalence of diabetes varied by race and gender within various BMI groups. For example, they found that when compared to Whites in normal and overweight groups, Blacks had an increased prevalence in diabetes diagnosis. They also found that the ratios of diabetes between Blacks and Whites in the normal weight group increased from 1.4 in NHANES I to 1.9 in NHANES 1999–2004. Interestingly, the largest increase in the disparity between Blacks and Whites diabetes diagnosis was in the normal weight group. These findings held true historically as well for Resnik et al. (1998) also found non-obesity related racial disparities in diabetes diagnosis, where there was a 71.4 percent increase

in diagnosis in the normal weight group Blacks and Whites. According to these studies, diabetes (a chronic inflammatory disease) has been almost exclusively linked with obesity even though non-obese people are susceptible to the chronic inflammatory diseases process.

Undiagnosed: Contributing Factors

The majority of hypertension studies have systematically researched few of the many etiological factors (e.g. clinical characteristics) that influence hypertension outcomes, and even more rarely have socioenvironmental factors been assessed. A few researchers have found that behavioral issues (e.g. attitudes about medications, doctor mistrust, and beliefs about health care) and patient self-management not only affects adherence to medication, but may significantly contribute to racial disparities in hypertension control (Bloche 2001; Buys et al. 2015; Kressin et al. 2010; Niska 2011; Ong et al. 2007). Using these research findings, one could argue that if the U.S. wants to decrease heart disease and stroke related deaths in Black adults, then one step would be to first eliminate racial disparities in hypertension control.

Bosworth et al. (2002) were forerunners in the construction of a theoretical framework of psychosocial and cultural factors that influences hypertension control outcomes. They factored into their theoretical model sociodemographic characteristics like age, education, health literacy, and psychosocial factors such as beliefs and attitudes about health and illness, as well as socioenvironmental factors like beliefs about hypertension and its

cures. But, this model had a weakness in that it did not account for causal or antecedent relationships nor did it account for comorbid conditions like diabetes. Interestingly, one study found that there was no association between race and hypertension control. Bosworth's theory was tested by Kressin et al. (2010), and they found that after controlling for medication adherence, discrimination, and medical mistrust, then racial disparities in hypertension control disappeared. But, the majority of studies found that discrimination and racial bias, medical mistrust and medication adherence- contributed to the racial disparities in hypertension control.

Research has also shown that obesity is a sufficient condition to inspire comorbid diabetes, but it is not necessarily a required predisposition for a chronic reaction to the toxic exposure of hyperglycemia (i.e. diabetes) (for more details see Ruderman 1998). Yet, the recent attention from the media, federal agencies and the medical community to comorbid obesity and diabetes has led to an undiagnosed disparity by race and gender for normal weight people who have diabetes. Gregg et al. (2004) studied how diagnosed prevalence in diabetes diagnosis differed between racial groups and found that the normal range BMI groups had the highest disparity. In their study, they propose a need to improve diabetes awareness and detection for people in the less than 35 BMI weight group. Wang and Beydoun (2007) found that even though there was increased prevalence in obesity across all racial/ethnic groups, racial disparity in diabetes prevalence varied by BMI (normal range

BMI respondents were less likely report a diabetes diagnosis) after their study analyzed differences in body weight status.

Research has shown that etiological factors for hypertension and diabetes like poverty are antecedents for physical distress, and an analysis of research on health outcomes revels why. Research shows that the poor and working poor have limited access to safe places to live, and these areas are more likely to have limited infrastructure (Buys et al. 2015; Kell et al. 2015; Wang and Beydoun 2007). Studies show that people without resources often live in dangerous neighborhoods (lacking the foundational concerns-safety and security- in Maslow's hierarchy of needs) (Maslow 1943), have limited social networks, and lack access to basic healthcare (Buys et al. 2015; Diez-Roux et al. 1997). Thus, they are more likely to have undiagnosed and resulting negative health outcomes than those who live in a safe well-resourced neighborhood (Diez-Roux et al. 1997; Fish et al. 2010; Tucker-Seeley et al. 2009). Furthermore, food deserts and limited recreational facilities further contribute to disparities in negative health outcomes (Walker, Keane, and Burke 2010). There is general consensus that the chronic stress of poverty and living in disadvantaged neighborhoods increases one's allostatic load (physiological system strain).

Pre-Katrina and Post-Katrina Diagnosis Environments

"Katrina highlighted a population already left behind by government, civic, and corporate leadership… If we do not use this moment to address the underlying vulnerabilities of poor and minority communities, we will only perpetuate the social determinants that manifest themselves in health disparities and human suffering. (Sandra Quinn 2006:24)."

The state of Louisiana had a vulnerable population that was disproportionately impacted by chronic diseases like heart disease and diabetes. As Quinn (2006) stated, natural disasters often magnify health disparities, and Hurricane Katrina could have served as the ecological force that inflated preexisting social determinants of health. The New Orleans Health Department (2013) released a report that showed that obesity increased 5.3 percent between 2002 (26.1 percent) and 2010 (31.4 percent). CDC county data on diagnosed diabetes reported that the age-adjusted percentage of adults with diabetes in Orleans Parish increased 1.5 percent, from 10.4 percent in 2005 to 11.9 percent in 2012, and it is estimated that a third of those with diabetes are undiagnosed. On the surface, it appears as though the underlying vulnerability of the poor and racial minorities was magnified by the disaster, and this public health concern needs more study.

Before Hurricane Katrina (2005), Black New Orleans residents comprised 69 percent of the New Orleans (Orleans Parish) population (Rudowitz, Rowland, and Shartzer 2006). Even though Blacks made up a significant portion of the

population, 23 percent of them subsisted on incomes below the poverty line (Cutter et al. 2006). They found that the poor were exceptionally disadvantaged by Hurricane Katrina and the storm exposed underlying socioeconomic inequality when the medical infrastructure was compromised. For example, following Katrina, 2010 population statistics from CDC data (released in 2012) reported that a statistically significant proportion of Blacks than Whites were diagnosed with hypertension (43 percent versus 26 percent) and diabetes (10 percent versus 16 percent). Additionally, these results showed that when compared to White New Orleanians, Blacks were 1.33 times more likely to die from heart disease and 3.03 times more likely to die from diabetes. Quinn (2006) found that Katrina not only exacerbated chronic health conditions, but also increased distrust of government agencies for Blacks.

Evacuees' Access to Healthcare

New Orleans 'frail' medical infrastructure was reportedly already strained for resources pre-Katrina, and compared nationally New Orleans had the lowest healthcare satisfaction rankings (Rudowitz et al. 2006). Studies reported that most of the already strained medical care facilities were almost destroyed by Hurricane Katrina and the resulting water damage (Aguirre 2006; Lister 2005; Vale 2008). Hospitals lost access to the basic necessities of medical care like medical equipment and prescription medication (Aguirre 2006; Handrich

2006). Some supplies like food and potable water were severely limited or even nonexistent. Gray and Hebert (2007) also reported that hospitals could not run their generators because of fuel shortages. Katrina damaged the basic infrastructure that was necessary for the minimal operation of area hospitals.

The bulk of research on heath disparities in Louisiana (pre-Katrina) were published before 2010, and there is a dearth of research past this point in time (e.g. Cutter et al. 2006; Kessler et al. 2007; Springgate et al. 2009). These studies found that health outcomes were exacerbated by a lack of economic resources which purportedly strained the Medicaid and medical systems. Rudowitz et al. (2006) found that there was already low reliance on private health care coverage and estimated that 21 percent (900,000) of the state of Louisiana did not have health insurance. They further reported that before the storm, Louisiana had one of the highest uninsurance rates in the country when compared to the rest of the nation where about 18 percent of adults were uninsured. They argued that this was in part because of the structure of the labor market, where 95 percent businesses (most often tied to the tourist industry) employed less than fifty workers. When compared to other businesses, tourism based businesses were less likely to offer private health care coverage. Cutter, et al. (2006:10) declared that the Hurricane Katrina disaster was "an unprecedented combination of natural forces and human failures" because an already dilapidated public health infrastructure was further destroyed by the hurricane. This lack of health insurance might have

been a critical blow for returners since medication and medical treatment were unaffordable. A survey of Katrina disaster victims (the 2006 Kaiser Family Foundation Report), living in Federal Emergency Management Agency (FEMA) housing, found that 44 percent of parents and 10 percent of children lacked insurance because of their resulting joblessness after the storm. This created the conditions that would further exhaust the health care system.

Returners' Access to Healthcare

> *"There needs to be an emergency effort to bring health care professionals to the Gulf region, to rebuild hospitals, to get people's medical conditions into databases that can be used wherever they end up." (Irwin Redlener, Director of the National Center for Disaster Preparedness (Burton 2006))*

After Katrina, when New Orleans residents began to slowly return to their city, studies show that they were faced with challenges in finding adequate medical care because hospitals were devastated and most returners could not afford healthcare (due to a lack of health insurance) (Arrieta et al. 2009; Kessler et al. 2007; Rudowitz et al. 2006; Zoraster 2010). For example, Rudowitz et al. (2006) published a Post-Katrina report on the state of health care for those returning to New Orleans. They found that one year after Hurricane Katrina, much of the city and its health care infrastructure, was still less than functional. They further reported that Charity Hospital (designed to

offer health care services for the poor and/or uninsured) closed because it was no longer in operable condition, and sick or injured people subsequently turned to Medicaid for assistance in some of the other hospitals in Jefferson parish (East and West Jefferson Medical Centers and Ochsner Clinic Foundation) that were able to remain open. According to the Louisiana Hospital Association (LHA), only three of the nine hospitals in Orleans Parish partially reopened as of August 2006. Moreover, the Louisiana Healthcare Redesign Collaborative (2006) report showed that hospitals went from being able to help an estimated 2,500 patients (pre-Katrina) to about 1,237 patients in December 2005, and increasing to 1,877 patients by July 2006. Abramson (2006:4) pointed out that "the problems experienced by Louisiana's displaced children and families can be related to breakdowns in systems related to access to healthcare and availability of ongoing healthcare". Brodie et al. (2006) reported that forty percent of the respondents from their study received no help from relief organizations like FEMA.

A review of the literature, found very little formal research on the incidence of new hypertension and diabetes cases immediately following Hurricane Katrina by race and gender. Of the studies available, researchers reported that there was a displacement of physicians (Rudowitz et al. 2006; Kessler et al. 2007). Research found that those with preexisting chronic diseases had significant disruptions to their medications, treatments and other healthcare services. For example, Kessler et al. (2007) studied a sample of 1,043 adult

(18+ years old) FEMA camp residents, and found that prior to Hurricane Katrina (in 2004), 73.9 percent of Katrina survivors had been diagnosed with one or more chronic illnesses and of these people 20.6 percent were forced to forgo treatment following the disaster. Their research substantiated previous studies (e.g. Abramson 2006) about the impact that displaced physicians had on the Katrina survivors' health outcomes. Kessler et al. (2007) found that 41.1 percent of Katrina survivors lacked access to physicians, followed by 35.5 percent who had reduced access to medication, and 29.3 percent of returners lacked sufficient health insurance. Findings from their research have been echoed in other studies that show that chronic disease sufferers experienced major disruptions to their medications and treatments due to difficulty accessing physicians, reduced access to medication, and a lack of health insurance (Handrich 2006; Kessler et al. 2007; Rudowitz et al. 2006). Arguably, immediate diagnosis rates for both hypertension and diabetes might have been affected by the lack of physicians available during this time.

Data

In order to test the proposed hypotheses (while using an intersectional theoretical framework) I will use data from the Displaced New Orleans Residents Survey (DNORS). According to Peterson, Sastry, Rendall, Ghosh-Dastidar, and Gregory, 2016, the DNORS sample frame consisted of Orleans Parish, Louisiana residents (this area overlaps geospatially with the City of New Orleans). The study population consisted of families living in Orleans

Parish, Louisiana, in August 2005, immediately prior to any residential dislocation caused by Hurricane Katrina. The DNORS surveyed pre-Katrina dwellings after identifying pre-storm residents who lived in these dwellings. Between June 2009 and May 2010, a stratified random sample of pre-Katrina residents were surveyed. Katrina survivors were interviewed if they could be found by telephone, or by telephone or in person if living in the Orleans Parish area. After finding the pre-Katrina residents, they were interviewed where they lived at the time of the survey. Both returning pre-Katrina New Orleans residents and former New Orleans Residents who resettled in locations outside of the city were included in the study.

The DNORS provides mental and physical health report data on a sample of Black women, Black men, White women, and White men. Not only do the data allow us to examine health diagnosis differences by race and gender, but also changes in health diagnosis pre and post Hurricane Katrina. More specifically, the data will be used to analyze respondent's physical and mental health status before and after Hurricane Katrina (which may also vary based upon social, economic or resource vulnerabilities, Groen and Polivka 2008; Seeman, Karlamangla, Koretz, & Seeman 2014). DNORS data were used to construct pre-Katrina and post-Katrina diagnoses differences, in which the resulting weighted percentages and unweighted numbers were compared. We restricted this analysis to those who are age 30 and older in 2009-2010, so that they would be at least age 25 and older in 2005. The racial and sex

composition of the DNORS sample is as follows: of the total 1,378 respondents aged 30 and older, 67.3 percent were Black and 32.7 percent were White, while 53.8 percent were women and 46.2 percent were men. More specifically, 37.7 percent were Black women; 29.6 percent were Black men; 16.1 percent were White women; and 16.6 percent were White men (see Table 1.1A). The 2010 Census estimates for New Orleans, Louisiana residents aged 30 and over of Whites and Blacks only- is in close approximation to DNORS percentages. 63.7 percent are Black and 36.3 percent are White while 52.4 percent are female and 47.6 percent are male. DNORS estimates are higher for Blacks with a 3.6 percent difference and slightly higher for females with a 1.4 percent difference.

Table 1.1A. Summary Statistics of New Orleans Adults Age 30+ in Survey Years 2009-2010 by Race and Gender (Unweighted Frequencies and Weighted Percentages) in comparison to summary statistics for the U.S. Census Bureau Age 30+ (Unweighted Frequencies and Weighted Percentages) in 2010

Race/Sex	DNORS[1]		Intercensal Estimates[2] (New Orleans, Louisiana)		Difference between DNORS and CENSUS %
	Frequencies	Weighted %	Frequencies	Weighted %	% Difference
Race					
Black	843	67.3	118,233	63.7	3.6
White	535	32.7	67,335	36.3	-3.6
Total	1,378	100	185,569	100	
Sex					
Female	838	53.8	97,238	52.4	1.4
Male	540	46.2	88,331	47.6	-1.4
Total	1,378	100	185,569	100	
Race/Sex					
Black Women	541	37.7	61,954	33.4	4.3
Black Men	302	29.6	56,279	30.3	-0.7
White Women	297	16.1	35,284	19.0	-2.9
White Men	238	16.6	32,052	17.3	-0.7
Total	1,378	100	185,569	100	

Data Source: [1]Displaced New Orleans Study (DNORS) (Ages 30+); [2]U.S. Census Bureau (Ages 30+)

Note: The DNORS population includes those who lived to 2009 or 2010.

Descriptive Statistics

Sociodemographic characteristics of New Orleans adults (age 30+) were analyzed to produce the following estimated population percentages (see Table 1.1B). More than half of the estimated population's race/sex groups were between the ages of 50 and 69, with a higher percentage of Blacks in this age range. More specifically, 62.6 percent of Black women reported being between the ages of 50 and 69 years old, which contrasts with only 54.0 percent of White women reported being between the ages of 50 and 69 years old, 63.7 percent of Black men were between the ages of 50 and 69 years old, while 61.9 percent of White men who reported being between ages of 50 and 69 years old.

DNORS population estimates indicate that Blacks had reported significantly fewer years of education than Whites. 39.4 percent of Black women and 52.9 percent of Black men had fewer than 12 years of education, whereas only 3.2 percent of White women and 4.5 percent of White men had fewer than 12 years of education. Also, only 18.7 percent of Black women and 18.0 percent of Black men reported having 16+ years of education, and this contrasts with the 29.0 percent of White women and 34.3 percent of White men who were estimated to have 16+ years of education. Blacks had a higher estimate of the percentage in the population who were single when compared to Whites- 61.2 percent of Black women and 61.2 percent of Black men were single, whereas only 41.8 percent of White women and 56.9 percent of White men were single. According to estimates, Whites were more likely to report to not be

religious: 11.0 percent and 16.6 percent of White women and White men respectively said they were not at all religious, whereas only 1.1 percent and 4.0 percent of Black men and Black women (respectively) indicated that they were not religious.

Table 1.1B. Sociodemographic Characteristics of New Orleans Adults Aged 30+ by Race and Gender (Weighted Percentages)

Race/Sex	Variable Labels	Race and Gender				χ^2 Statistic
		Black Women	Black Men	White Women	White Men	
		Weighted %	Weighted %	Weighted %	Weighted %	
Age	30-49 years	21.4	23.4	20.0	21.0	7.3*
	50-69 years	62.6	63.7	54.0	61.9	
	70+ years	16.1	12.9	26.0	17.0	
	Total	100	100	100	100	
Education	<12 Years	39.4	52.9	3.2	4.5	185.6***
	12 Years	30.0	47.2	9.6	13.3	
	13-15 Years	45.9	25.9	12.9	15.2	
	16+ Years	18.7	18.0	29.0	34.3	
	Total	100	100	100	100	
Household Income Quintiles	First Quartile	45.9	40.5	6.2	7.5	262.4***
	Second Quartile	45.9	34.9	10.2	9.0	
	Third Quartile	30.8	37.7	17.6	14.0	
	Fourth Quartile	21.0	37.3	16.0	25.7	
	Fifth Quintile	12.3	10.1	32.2	45.4	
	Total	100	100	100	100	
Marital Status (in 2005)	Single	61.2	61.3	41.8	56.9	14.2**
	Married/widowed	38.9	38.8	58.2	43.1	
	Total	100	100	100	100	
Religiosity	Not Religious	1.1	4.0	11.1	16.6	133.6***
	Religious	49.7	59.2	60.3	64.4	
	Very Religious	49.2	36.8	28.6	19.1	
	Total	100	100	100	100	
Total (N)		541	302	297	238	1,378

Source: Displaced New Orleans Resident Study (DNORS)
(* p<.05; **p<.01; ***p<.001)

Methods- Modeling Strategy

Chapters 3 and 4 use logistic regressions to measure the association between race and sex and mental and physical health outcomes for Katrina survivors (see Tables 3.3A-3.3B and 4.3A-4.3B). We model health outcomes as a binary measure of pre-Katrina (1999-2004) and post-Katrina (2005-2009/10) physical (hypertension and diabetes) and mental (emotional problem and depression) diagnoses against no diagnosis for each respective sample group. We refer to the post-Katrina sample as Sample A. It consists of DNORS respondents aged 30 and over in 2009/10. The pre-Katrina Sample B consists of DNORS respondents aged 36 and over in 2009/10. Both Sample A and Sample B are therefore adults aged approximately 25 years old and older at the start of the 5-year physical health condition diagnosis exposure. Using this binary approach enables us to contrast racial/sex groups by pre-Katrina versus post-Katrina diagnosis. The regression models in these analyses contrast diagnosis versus no diagnosis (Not Diagnosed vs. 1999-2004 Diagnosis and Not Diagnosed vs. 2005-2009/10 Diagnosis) respectively among individuals not diagnosed before 1999 and not diagnosed before 2005. This binary approach thereby estimates five-year risks of diagnosis by race and gender before and after Hurricane Katrina.

A logistic regression is a predictive analysis used when the regressor (e.g. no diagnosis vs. disease diagnosis) variable is dichotomous- and may not be polytomous (having more than two outcomes) (Szumilas 2010).

$$\log(R) = log\left(\frac{p1/(1-p_1)}{p2/(1-p_2)}\right) = log\left(\frac{p_1}{1-p_1}\right) l - \log\left(\frac{p_2}{1-p_2}\right) = logit(p1) - logit(p2)$$

The logistic regression can be used to explain the relationship between the outcome variable and other independent variable(s). This method should only be used if the log-odds of each outcome follows a linear model. Comparatively, a standard linear regression requires a continuous (interval) scale regressor variable and a binary logistic regression assumes that the dependent variable is stochastic. To measure the strength of association between two outcomes, the binary logistic regression is applied to a dichotomous outcome (0/1) variable where one response category is designated as the referent category (1), then the log-odds for the referent category is found. To calculate the odds a comparison between two groups is made: a control group and an exposure group. For the purpose of this study, the odds ratios are calculated using the variable's absolute risk divided by the control group's absolute risk, and most commonly expressed as a ratio (Diaz-Quijano 2012).

OR = 1	exposure has no effect on the outcome.
OR < 1	exposure decreases the risk of the outcome.
OR > 1	exposure increases the risk of the outcome.

In Chapters 3 and 4, we model the correlates of time at diagnosis using logistic regression models for 1,378 adults, who resided in the City of New

Orleans, Louisiana, in August 2005 just before Hurricane Katrina struck. The first models are an unadjusted comparison of the race/sex (e.g. Black Women, Black Men, White Women, White men) groups by diagnosis status/date of diagnosis (Not Diagnosed, 1999-2004 and Diagnosis and 2005-2009/10 Diagnosis). The second set of models are adjusted by sociodemographic (e.g. Race/Sex, Age, Education, Income, Marital Status, and Religiosity) variables to minimize the probability of a spurious association. The results of the logistic regression models are odds ratios (OR).

An Intersectional Evaluation of Diagnosis Reporting

In Chapter 2, we evaluate self-reporting consistency within three diagnosable physical and mental health conditions to determine the reliability and consistency of self-reports, using a longitudinal study- the Panel Study of Income Dynamics (PSID). The PSID offers a national analysis of reporting of similar health conditions (e.g. hypertension, diabetes, and psychological distress) as those reported in DNORS (e.g. hypertension, diabetes, emotional problem and depression). The PSID (biennial years 1999-2013) also offers reporting from a similar time period as DNORS (Sample A and Sample B diagnosis years 1999-2009/10), and has large samples of the four race/sex groups of interest (Black women, Black men, White women and White men). This analysis is necessary to substantiate the validity of an intersectional approach which relies on assumptions of similar reporting accuracy between race and gender groups.

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Chapter 2: The Data: The Intersectionality of Diagnoses Reporting of Hypertension, Diabetes and Psychological Problem in Longitudinal Data (PSID)

Abstract

Background

These consistency reporting analyses use panel data, with repeated self-reports, to test the reliability of hypertension, diabetes and psychological problem diagnosis in the Panel Study of Income Dynamics (PSID). Since self-reported information is heavily relied upon in epidemiological studies, researchers often use this data to produce 'unbiased' estimates of population health. Inconsistent self-reports may bias estimates of population health and skew measures that emanate from inconsistent self-reports. Inconsistent self-reporting may vary by race and gender, so an intersectional framework is used to examine whether or not differences in inconsistent reporting significantly vary by race and gender.

Methods

Self-reports from 20,020 adults (aged 18+), who in at least one of eight waves of the Panel Study of Income Dynamics (1999-2013) indicated a diagnoses of hypertension, diabetes and psychological problem will be analyzed. These Poisson regression analyses will enable us to determine the consistency of hypertension, diabetes and psychological problem diagnosis of self-reports as

well as enable us to determine various individual and disease-related characteristics of PSID individuals.

Results

The term inconsistent report means that individuals indicated a negative diagnosis (for hypertension/diabetes/psychological problem) after the respondent indicated a positive disease diagnosis in a previous wave. 33.8 percent of individuals gave inconsistent hypertension reports, 12.5 percent of individuals gave inconsistent diabetes reports, and 16.0 percent of individuals gave inconsistent psychological problem reports. 32.3 percent of individuals reported one disease inaccurately, 11.5 percent of individuals reported two diseases inaccurately, and 2.2 percent of individuals reported all 3 diseases inaccurately. Ultimately, Poisson regression analyses indicated that there was a statistically significant difference in inconsistent response rate by proxy status, number of waves, age, marital status, home ownership and income. The intersections of race and sex were not statistically significantly associated with reporting variability.

Conclusion

Results suggest that reporting error for disease diagnosis is a concern. Since about two out of five (41.9 percent) individuals reported at least one disease inconsistently, then these measures may contain significant measurement error. Final analysis indicates that the intersections of race and sex were not associated with reporting variability after accounting for proxy status and

class related characteristics. Factors such as income, homeownership, education and age significantly decreased the likelihood of misreporting.

Key Terms: cardiovascular disease, diabetes, self-reporting, chronicity, consistency reporting

Introduction

Accurate assessment is essential for the construction of precise estimates of a population's health status, as well as to evaluate the effectiveness of any interventions designed to decrease the harmful effects of chronic disease formation and progression. Self-reports are one of the primary ways of acquiring data for epidemiological and population studies. Knowledge constructed from these self-reports provide epidemiologists and social scientists with information on various health conditions in the population. Self-report data are used to analyze disease trends over time to inform health policy, and may be used to evaluate correlations between sociodemographic, socioeconomic, and health-behavior factors. To produce unbiased and precise estimates of population health status, self-reported data needs to be accurate. This study will evaluate and address the reliability of individual self-reports over time as well as how the accuracy of self-versus-proxy responders has on the reliability of self-reported data.

Chronicity has become problematic in that the constellations of chronic conditions are growing rapidly. Goodman, Posner, Huang, Anand, Koh, & Howard (2013) found that over the past two decades, those who are diagnosed with multiple chronic conditions has increased significantly. They predict that the prevalence of chronic diseases and other chronic conditions, in the US population, may continue to increase due to factors such as age distribution. They also found that the persistently high prevalence of risk factors for chronic conditions, are in part due to increased life expectancy and an increasing aging population. These factors have conversely impacted many epistemological predictions. Goodman et al. (2013) warn that the ability to sufficiently measure various chronic conditions (e.g. diabetes and hypertension) directly impacts their prevention and mitigation. Inconsistent definitions, diagnostic classification schemes, and heterogeneity in data systems and methods of data collection only serve to further exacerbate these health problems (Goodman et al. 2013).

In the present study, we evaluate self-reporting of three conditions, hypertension, diabetes, and psychological problem. Hypertension, diabetes and depression are of major interest to the public health sector because of their projected increase in diagnosis, chronicity, and the potentially negative effects these conditions may have on the population and the U.S. economy. Preferably, surveillance of hypertension, diabetes and depression prevalence would be based on professionally measured blood pressure, blood tests or

psychological examinations, but information on the prevalence of these health measures are often gathered by questionnaires. Health questionnaires are routinely used by researchers because they offer a relatively inexpensive and efficient way to collect health data, when compared to costly and time consuming physical examinations. But, the validity of the information collected in questionnaires should be questioned. The primary objective of this study is to evaluate the reliability and consistency of self-reports while using a longitudinal study- the Panel Study of Income Dynamics (PSID). Also, factors that affect the accuracy of self-reporting data gathered from questionnaire information for estimating the prevalence of hypertension, diabetes and depression will be examined.

This research focuses on disparate health outcomes by both race and gender. To do so, an intersectional analytical framework is used to uncover racial *and* gendered self-reporting differences. An intersectional frame is used here to address what McCall (2005) warns against- the compartmentalization of oppression into distinct categories, such as what occurs in a race-centric or gender-centric analysis. McCall (2005) instead encourages researchers to treat socially oppressive forces as simultaneously occurring spheres of oppressions that reinforce one another. Yuval-Davis (2006), further supports this notion of not adopting a compartmentalized theoretical/analytical stance and contends that it can have deleterious consequences, since very little attention is given to how racism and sexism reinforce one another. She further contends that a

segmented or categorical approach often ignores the interconnectedness of the overarching social constellations of race/class/gender. Using this logic, a race/gender interaction term will be used for the basis of this research when evaluating differences in the validity of self-versus-proxy reports.

Intersectionality was developed to explain the ways in which multiple spheres of oppression interact with one another to create social disparity (Crenshaw 1989). An intersectional lens is particularly useful for this analysis also due to its epistemological flexibility (Collins 2000). The nomothetic value of this approach lies in its ability to critically engage with how "intersecting" or interlocking forces of domination, like racism and sexism, impact marginalized groups (Crenshaw 1989). Yet, it also has high ideographic value due to its ability to explain the process of marginalization at the individual level as well (Alexander-Floyd 2012). This theoretical flexibility may enable this research to reflect on how race and sex converge to create health outcome differences. Because the social constraints in health care access, stressors and healthfulness can vary widely due to gendered and racial differences, self-versus-proxy reports may in turn reflect this social variability found in the population. An intersectional framework may allow this study to further illuminate disparities in health reporting behavior that otherwise might go unnoticed.

Literature Review

Hypertension

Hypertension may lead to cardiovascular disease (the first leading cause of U.S. deaths), stroke (the fifth leading cause of U.S. deaths), kidney failure, and other chronic health conditions ((National Center for Health Statistics 2017)). The National Center for Health Statistic's (NCHS) [3] U.S. 2017 health report found that thirty-three percent of U.S. adults aged twenty years or older have hypertension. Using this estimate, approximately seventy-eight million U.S. adults are hypertensive- the hypertensive make up about twenty-five percent of the U.S. population[4]. The NCHS also found that eighteen percent of hypertensive adults were unaware of their hypertension, fifteen percent were not using antihypertensive medication, and of those who were diagnosed and treated, only forty-seven percent reached target blood pressure levels. The NCHS report did not indicate that gender mitigated the prevalence of hypertension, since they found no significant difference when men's and women's rates were compared. Yet, they did find racial differences. For example, forty-four percent of Black U.S. adults (20+) were hypertensive and they noted that this was the highest prevalence in the U.S. and the world.

[3] The CDC/NCHS used data from the National Health and Nutrition Examination Survey (1998-2016), and published this information in the Health-United States-2017 report. These measures exclude pregnant women.

[4] The Census Bureau estimates the total 2019 U.S. population to be 329.06 million people, and 255.3 million Americans are aged eighteen and over.

Diabetes Mellitus

The NCHS currently (2017) estimates that 33.9 percent of adults ages 18 and older are prediabetic. They also estimate that 9.4 percent of the US population have diabetes. Of those who have diabetes, 76.2 percent are diagnosed, and 23.8 percent of diabetics are unaware of their diabetic status. That means that over thirty million Americans have diabetes mellitus, and an estimated 7.2 million American adults (18+ years) have undiagnosed diabetes. The Centers for Disease Control and Prevention (2017) also estimates that 33.9 percent of U.S. adults had prediabetes (abnormal fasting glucose levels)- that's an estimated 84.1 million Americans. In the U.S., African Americans and other ethnic minorities are disproportionately affected by diabetes. It is estimated that 23.9 of Blacks are diagnosed with poor glycemic control (A1c greater than 9 percent) by physicians. The overall prevalence of diabetes is on the rise and the nefarious condition is expected to steadily increase. The CDC, NCHS and the American Diabetes Association all predict that more people will become diabetic over time.

Psychological Problem

According to the Center for Behavioral Health Statistics and Quality (2018), the prevalence of major depressive episodes among United States adults aged 18 and higher was as follows: 7.1 percent of U.S. adults (which is an estimated 17.3 million U.S. adults) were diagnosed with depression. In consideration of depression diagnosis for U.S. adults, gender, age and mixed

racial status significantly increases prevalence of diagnosis with at least one major depressive episode. When compared to men (5.3 percent), adult women (8.7 percent) had a higher prevalence of depression diagnosis. Adults aged 18-25 (13.1 percent) had the highest prevalence of being diagnosed with a major depressive episode. Even though race is a social construct, not a biological reality (Andreasent 2016), adults reporting two or more races (11.3 percent) had the highest prevalence of being diagnosed with a major depressive episode in relation to adults who reported or identified with one racial category.

Accuracy of Self-Reports of Health Conditions

A number of studies evaluated the accuracy of subjectively reported (self-reported) data for chronic disease (e.g. hypertension, diabetes and depression) incidence in adults. Some studies evaluated the accuracy of self-reported health conditions by comparing them to other sources of information, such as medical records and/or health registries ((Schenker, Raghunathan, and Bondarenko 2010). For example, Molenaar, Ameijden, Grobbee, and Numans's (2007) research evaluated the accuracy of a single report, per individual, but did not address the reliability of individual self-reports over time. They caution that since both researchers and epidemiologists use self-reported data to estimate the prevalence of hypertension and diabetes (as well as other chronic conditions), inconsistency in this reporting could lead to differential misclassification- which is an underestimation of prevalence estimates and biased risk factors (Beltrán-Sánchez et al. 2013).

A study on consistency reporting in cardiovascular disease (CVD) and diabetes by Johansson, Hellénius, Elofsson, and Kraka's (1999) found that when evaluating the consistency of self-reported data, men were more likely to underreport CVD. They showed that women were more likely to be aware of their hypertension diagnosis and report it accurately whereas men's awareness of their hyperlipidemia was low. Interestingly, they found that the rate of misclassification for hypertension was higher than diabetes. More specifically, they discovered that in questionnaires, 65 percent of the cases of hypertension and 40 percent of the cases of diabetes were misreported, when self-reported diagnosis is compared to blood tests results. For hyperlipidemia, Johansson et al. (1999) found that self-reporting is highly inaccurate and warns that self-reporting is an unreliable instrument due to limited awareness and inaccurate knowledge about hypertension risk factors. They highly encourage the addition of biometrical measurements to self-reported questionnaire information in order to strengthen the data's validity.

Valid self-reported hypertension data should accurately reflect hypertension diagnosis status. By now, there should be copious amounts of research on the validity of reporting vs. diagnosis status, but instead there is a dearth of research on the validity of self-reported hypertension in nationally representative data sets. Much of this work is dated, completed by social scientists, over three decades ago, with the bulk emanating from the 1980's

and 1990's. More research is required. That is why it is not only necessary to test the validity of self-reported data, but to also produce a sensitivity analysis showing specific details of the ways in which self-report data may misrepresent the subjects' diagnosis status.

A review of the literature found sensitivity estimates using NHANES III data, but these two studies lacked predictive values- either positive or negative (Burt, Whelton, Roccella, Brown, Cutler, Higgins, Horan, and Labarthe (1995) and the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (Chobanian et al. 2003)). To contrast previous efforts, Vargas, Burt, Gillum and Pamuk (1997) tested the validity of self-reported hypertension data using various sensitivity analyses of NHANES III data, and found that the validity of self-reported hypertension for women, the obese, and recently diagnosed individuals was higher. Furthermore, they found that the strength of NHANES data was in its validity for non-Hispanic White men and women as well as non-Hispanic Black women, and those diagnosed in the previous year. Furthermore, they discovered that those who rarely sought medical care or who had not sought medical care regularly, had low self-report validity. Although this study offers some insight into inconsistent reporting, the literature on the validity of self-reported data for hypertension requires major updating.

To compare, self-reported diabetes studies are more numerous than hypertension studies on self- reporting accuracy, but a few gaps in the literature remain. Overall, the analysis of the reliability and validity of self-reports in large data sets is lacking. One study determined whether self-reports are valid measures of the rate of diabetes in the population of U.S. adults aged 18 and over. Margolis et al. (2008) compared Women's Health Initiative (WHI) self-reports of diabetes diagnosis with data from fasting glucose measurements. Furthermore, a number of U.S. population-based studies have addressed the validity of self-reports (Barcellos, Goldman, and Smith 2012; Kehoe et al. 1994; Margolis et al. 2008) and their research uncovered a range of accuracy in self-reported diabetes, when compared to medical records, 64 percent to 98 percent. Most notably, the variance in the accuracy of self-reporting rates in this body of research was possibly caused by several reasons: researchers' medical record access, the clarity of the self-report question, and various personal traits that influence medical diagnosis awareness.

In epidemiological studies on mental health, the validity of self-reported medical depression diagnosis has been called into question. A few longitudinal studies assessed the validity of self- reported depression diagnosis (Conijn et al. 2016; Zimmerman et al. 2006), but this evaluation was juxtaposed against the depressive symptom scale (e.g. The Center for

Epidemiologic Studies Depression Scale (CESD))[5]. Most importantly, these studies did not investigate the validity of previously medically diagnosed self-reports as compared to medical reports, which is the primary focus of this research. Instead, scale studies often focus on the arbitrary nature, for example, of sample characteristics such as age, pathology, educational level used to determine cut-off points on these scales (Albert et al. 2016; Conijn et al. 2016; Gotlib, Lewinsohn, and Seeley 1995; Sanchez-Villegas et al. 2008; Uher et al. 2012; Zimmerman et al. 2006). Furthermore, these scale studies were much more focused on using self-reported diagnosis of depression to reduce costs in epidemiological studies- not to increase the understanding of how valid self-reporting as a measure is to socio-demographic research (Bisschop et al. 2004; Uher et al. 2012; Zimmerman et al. 2006).

The most recent analysis of longitudinal data that very closely examines the validity of self-reports, is a study conducted by Cigolle et al. (2018). These gerentological researchers investigated misreporting of chronic diseases and depressive symptoms by looking for logical inconsistencies in reports of having been diagnosed with a chronic condition. They initially hypothesized that there would be increased incidence of reporting inconsistencies due to individuals having a cognitive impairment (e.g. Alzheimer's/Dementia), being racial minorities, having low educational attainment, and/or low

[5] In 1977, using the American Psychiatric Association Diagnostic and Statistical Manual, fifth edition, the Center for Epidemiologic Studies Depression Scale (CESD) was created by Laurie Radloff. It was later revised in 2004 by William Eaton and others. The depression scale consists of 20 questions aimed to measure depressive symptoms.

socioeconomic status. They conducted this research because "it is paramount that these surveys produce valid and reliable population estimates of chronic diseases and chronic disease risk (Cigolle et al.: 902)." Finally, they developed an adjudication method, following a secondary data analysis of the of the Health and Retirement Study (HRS), in order to mitigate the misreporting that occurred in their analysis of the chronic disease data, from Waves 1995–2010.

To mitigate the self-misreporting error, Cigolle et al. (2018) developed 4 misreporting schema. In type one, the respondent disputes a previous chronic illness diagnosis (e.g. No Diabetes, No Diabetes, Diabetes, Dispute); in type two, the respondent reports a diagnosis after not being diagnosed in previous waves and then reports "don't know or refused to report"; in type three, reports the respondent provides a no response after a positive diagnosis response, and in type four, the respondent disputes any previous chronic disease diagnosis. Using the follow up reports in the HRS waves, they then created algorithms to adjudicate inconsistencies in the self-reported data. Regardless of the respondent's self-reporting diagnosis, they "logically" assign individuals to having a disease, even in waves where disease is disputed. The logic they use is consistent, though paternalistic. If secondary evidence was present (e.g. positive indication of the use of medication or heart surgery), then they conscript the respondent to a 'yes' diagnosis category even if the respondent disputes prior disease diagnosis.

Using their adjudication method, Cigolle et al. found that of the estimated 30 percent of misreports, the inconsistencies were highly associated with individuals' demographic characteristics. Those most likely to inconsistently report were low SES[6], unmarried, Hispanic women, as well as those with cognitive impairment (regardless of self or proxy reporting status). An intersectional perspective would have allowed researchers to more efficiently evaluate these trends and subsequently offer better predictions and socio-behavioral explanations for these patterns.

Overall, studies on misreporting often took gender (Margolis et al. 2008; Schenker, Raghunathan, and Bondarenko 2010) and race (Mokdad et al. 2003; Morrissey et al. 2006; Margolis et al. 2008; Schenker, Raghunathan, and Bondarenko 2010) into analytical consideration, but none used an intersectional framework to analyze disparities in inconsistent self-reports. It is imperative to begin with an intersectional analysis- especially since the results of demographic and epidemiological analyses are virtually all intersectional in nature. It is by the narrowing down process that these important social patterns emerge. Beginning with an intersectional analytical framework will allow for this process to occur efficiently from start to finish by initially considering the intersectional nature of socio-demographic trends.

[6] Socioeconomic Status (SES) is a complex measure of a person's economic and sociological position. A person's income, education, and occupation as well as their social status are inferred by this measure. Socioeconomic status is inextricably linked to desperate health outcomes. For example, high SES people tend to be healthier than poorer people see Erreygers and Kessels (2017) study for more detail.

That is why an intersectional framework guides this research on the validity and reliability of self-reported longitudinal data.

Hypotheses

H1: When considering the most accurate self-reports, or the least percent inconsistent, mixed self/proxy reporters will be the most inconsistent (least consistent) when compared to always-self and always- proxy reporters for individuals diagnosed with a chronic illness.

H2: When considering the most accurate self-reports, or the least inconsistent, sex (Women) and race (White) will be most consistent.

Data

The Panel Study of Income Dynamics (PSID) contains over 45 years of household panel survey data (Panel Study of Income Dynamics 2016) – collected via telephone after 1972 using a computer-assisted instrument. This life course data archive provides researchers with an opportunity to analyze complex associations between gender, race, and health. The PSID are publicly available data. The PSID contains 45 years of data on about 70,000 individuals culminates into a sizeable data set of about 70,000 variables. The data can be further subdivided into three sections, Disability and Use of Time, Child Development, and the Transition into Adulthood study that can be used to trace changes over the life course.

From 1968 to 1997, interviews were conducted yearly and from 1999 to 2015, interviews switched to a two-year rotation (Panel Study of Income Dynamics 2016). The original 1968 sample was created by oversampling 1,872 low income families (about 18,000 individuals) who are eligible for future interviews. In the 1990's, the PSID added health measures. Data on both physical and mental health conditions (e.g. diabetes and hypertension), as well as health behaviors, are collected. The data offer researchers the chance to evaluate changes in health, and the relationship between health status and socio-demographic characteristics over time. The longitudinal design and breadth of the data provides this research with the ability to assess the evolution and progression of intergenerational life course health changes.

Methods

The purpose of this study is to analyze the reliability of individual self-reports over time and evaluate what influence the accuracy of self-report versus proxy-report has on the reliability of self-reported data. The PSID survey protocols for identifying a proxy versus a self-reporter begins with the head of household designation (Head). Head of household was defined in the PSID through each family unit (FU) within each data wave. If a FU contained both a husband and a wife, then the husband was designated as the head of household (this mirrored the Census Bureau designation of head of the household at the onset of the study). Because of changes to the composition of the family over time, the Head designation might have changed as well. If a new Head was

selected, then the person had to fulfill certain conditions to be assigned this designation. The person had to be 16 years or older and be the primary person who was financially responsible for the maintenance of the family unit.

In order to identify proxy versus a self-reporter, the following variables are used, the PSID assigned the 1968 Family ID number (ER30000) and the Person Number (ER30002) to provide a unique identification number for every respondent included in the data file. All individuals' data were merged under his/her unique identification code. Following this procedure, to determine if the respondent was self or another person, a survey question was assigned to each survey year in which the PSID indicated: "Who was respondent" (e.g. ER13016 (99); ER17019 (01); ER24073 (03); ER27879 (05); ER40869 (07); ER46697 (09); ER52097 (11); ER57901 (13). Using the "who was respondent" variable, I coded the data into categories indicating whether or not the respondent was either always a self-respondent, always a proxy-respondent, or a mixed self/proxy-respondent category for each consecutive person year. Analyses were conducted with the PSID- supplied individual weights for the survey years of interest (e.g. biennial years 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013).

Nationally Representative Survey Estimate Comparisons

Initially, descriptive statistics from the PSID were compared to published authoritative (e.g. NHANES, NHIS, and NSDUH) data. To do so, the

weighted prevalence of each condition was calculated and then comparisons were made against the National Health and Nutrition Examination Survey (NHANES) which is measured by health professionals for hypertension, the National Health Interview Survey (NHIS) which contains self-reported data on diabetes, and the National Survey on Drug Use and Health (NSDUH) which reports psychological problem prevalence. Matching biennial survey data were used in the comparison, where possible, and there was some variability in the construction of adult years. The NHANES defined adults as individuals who were 18 years or older; the NHIS defined adults as those who were 22 or older, and the NSDUH defined adults as those individuals who indicated they were 18 and older.

Continuous Outcome Variable

This research analyzed PSID data on three diagnosed statuses. Those surveyed indicated that they were diagnosed with hypertension, diabetes and/or a psychological problem. Using the PSID, hypertension, diabetes and psychological problem diagnosis was defined as individuals having been diagnosed by a healthcare professional, at least once, with hypertension, diabetes or a mental health problem. Hypertension, diabetes and psychological problem undiagnosed status was defined as individuals who never received a hypertension diagnosis from a healthcare professional (e.g. H5. Has a doctor ever told you that you have or had any of the following: b. high blood pressure or hypertension?; c. diabetes or high blood sugar?; and h. any emotional,

nervous, or psychiatric problems?) (see Appendix A). Following the construction of the dependent variables (indicating a yes/no diagnosis by reporting year 1999, 2001, 2003, 2005, 2007, 2009, 2011, and 2013), this analysis then computed different indicators of inconsistent reporting. A variable was constructed to indicate if there were any inconsistent reports over 8 waves (any 'No' that follows a 'Yes'). The number of inconsistencies (e.g., more than one instance of 'No' that follows a 'Yes') for hypertension (0-7), diabetes (0-7) and psychological problem (0-7). These inconsistencies were then totaled into the number of inconsistent reports (from 0 to 21).

Categorical Outcome Variable

A dummy variable was created for individuals who were either consistent in reporting their health condition diagnosis for hypertension, diabetes, and psychological problem across all eight waves or not. Next, the outcome variable was constructed using the total number of inconsistent reports cross all three health conditions. Then, the three individual health condition inconsistent report totals (Hypertension (0/1), Diabetes (0/1), Psychological Problem (0/1)) were combined into a categorical variable, ranging from 0 to 3 inconsistent reports across all three health conditions, to be used in univariate and bivariate analyses.

Race/Sex Analyses

For the race/sex analyses, four intersectional race/sex categories (e.g. Black women (16.2 percent), Black men (20.7 percent), White women (9.6 percent), and White men (53.4 percent) were constructed (see Table 2.1A) for individuals surveyed within the reporting years of interest (1999, 2001, 2003, 2005, 2007, 2009, 2011, and 2013). These race/sex categories were then analyzed for health outcome inconsistency.

Following the dependent and primary independent variable construction, a Poisson regression model was used to measure the strength of the association between the total number of inconsistent reports with proxy status, number of waves, race/sex and other sociodemographic variables of interest. According to Koletsi and Pandis 2017, this regression model's strength lies in its log-linear approach that is most appropriate to use when the dependent variable is a discrete count variable. They further stipulate that the following assumptions must be met in order to utilize this model: an event must occur at an interval rate and be a non-negative value (e.g. 0,1,2…); it must be independent- if one event occurs it cannot affect the probability of a second event, and be constant. Also, two events cannot occur simultaneously- it must either exist or not within a particular interval of time or space. According to Hoffmann et al. 2008, the Poisson regression is able to produce Incidence Rate Ratios (IRR),

which are exponentiated coefficients. The IRR's can be interpreted as follows: the incidence rate 1 (event 1 divided by person time) is divided by the incidence rate 2 (event 2 divided by person time). This produces a measure (IRR) of the effect of an exposure. An IRR greater than 1 increases the risk of the outcome; an IRR less than 1decreases the risk of the outcome; and an IRR that is equal to 1 has no effect on the outcome.

Results

Hypertension Diagnosis Inconsistencies

A descriptive statistical analysis of the weighted data from the biennial years ranging from 1999 to 2013, indicated that the percentage of individuals who indicated they were diagnosed with hypertension gradually increased by 13.6 percent, over time, from 20.6 percent in 1999 to 34.2 percent in 2013 (see Table 2.1C). When comparing the PSID against prevalence measures indicated from the NHANES, some variability was found. Specifically, in 1999 the NHANES showed that 28.4 percent of individuals were diagnosed with hypertension and in 2013 that figured increased only by 0.9 percent, to 29.3 percent (see Table 2.1C). Next, the total number of inconsistencies were measured and for hypertension, the analysis indicated that 25.2 percent of those who indicated a diagnosis of hypertension over PSID biennial years 1999-2013 made an inconsistent report (see Table 2.1B). Overall, as the number of inconsistent reports increased the percentage of inconsistent reports decreased. For example, 37.0 percent of individuals who inconsistently indicated their hypertension diagnosis, did so once, whereas only 6.9 percent

of individuals inconsistently indicated their hypertension diagnosis seven times (see Table 2.1B).

Table 2.1A. Percentage of Diagnosable Chronic Health Conditions (Hypertension, Diabetes, and Psychological Problem) Reported Inconsistently and Diagnosed for Adults Age[C] 20+ (PSID Biennial Years 1999-2013), Weighted

Number of Inconsistent Reports[a,b]	Hypertension Percent	Diabetes Percent	Psychological Problem Percent	All Health Conditions Percent
1 Inconsistency	37.0	44.0	24.5	32.3
2 Inconsistencies	17.2	10.2	15.4	14.4
3 Inconsistencies	12.5	11.4	16.9	14.5
4 Inconsistencies	10.5	8.0	13.8	10.8
5 Inconsistencies	8.2	9.6	14.2	10.5
6 Inconsistencies	7.7	9.2	8.1	9.5
7 Inconsistencies	6.9	7.6	7.1	8.1
Total	100	100	100	100
Observations (N)	4,219	1,762	2,072	6,156
Total % Inconsistent	25.2	11.9	14.1	41.9

Notes:

a. Percentage distribution unless otherwise noted.

b. Number of diagnosable health conditions (Hypertension, Diabetes, and/ or Psychological Problem) reported inconsistently at least once. It is possible for up to 7 total inconsistent reports per health condition.

c. Age is restricted to adult respondents who are at least 25 years old in 2005, so that they are at least 20 years old and older in 1999.

Source:

Panel Study of Income Dynamics (PSID) biennial years 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013.

Table 2.1B Comparison of Physical and Mental Health Outcomes for PSID U.S. Adults (Age[e] 20+) (Biennial years: 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013) to Other Nationally Representative Data

Year	Hypertension[b]		Diabetes[c]		Psychological Problem[d]	
	PSID 20+ (%)	NHANES 18+ (%)	PSID 20+ (%)	NHIS 20+ (%)	PSID 20+ (%)	NSDUH 18+ (%)
1999	20.6	28.4	6.7	5.4	5.2	4.9
2001	21.7	27.9	8.1	6.4	5.1	4.9
2003	23.3	29.9	8.3	6.6	7.0	6.0
2005	24.6	29.1	8.7	7.4	7.2	4.9
2007	28.5	29.6	9.1	7.7	7.5	4.8
2009	30.0	28.6	9.9	9.0	8.1	4.8
2011	31.5	28.7	11.1	8.9	8.3	6.7
2013	34.2	29.3	12.0	9.3	9.1	6.9

Notes:

a. Percentage distribution unless otherwise noted.

b. National Health and Nutrition Examination Survey (NHANES) results were reported by: Yoon, S. S., Carroll, M. D., & Fryar, C. D. 2015. Hypertension Prevalence and Control Among Adults: United States, 2011-2014. NCHS data brief, 220: 5.

c. National Health Interview Survey (NHIS) figures were reported in the Centers for Disease Control and Prevention. 2015. Crude and age-adjusted rates of diagnosed diabetes per 100 civilian, non-institutionalized adult population, United States, 1980-2014.

d. National Survey on Drug Use and Health (NSDUH) Emotional Problem Treatment estimates Source: SAMHSA, Center for Behavioral Health Statistics and Quality, National Survey on Drug Use and Health, 1999-2013. U.S. Department of Health and Human Services- Substance Abuse and Mental Health Services Administration

e. Age is restricted to adult respondents who are at least 25 years old in 2005, so that they are at least 20 years old and older in 1999.

Sources:

Panel Study of Income Dynamics (PSID)
National Health and Nutrition Examination Survey (NHANES)
National Health Interview Survey (NHIS)
National Survey on Drug Use and Health (NSDUH)

Diabetes Diagnosis Inconsistencies

A descriptive statistical analysis of the weighted data from the biennial years ranging from 1999 to 2013, showed that the percentage of individuals who indicated that they had been diagnosed with diabetes gradually increased by 5.3 percent over time from 6.7 percent in 1999 to 12.0 percent in 2013 (see Table 2.1C). When comparing the PSID against prevalence measures indicated from the NHIS the indicated percentages were similar- although the PSID percentages were lower. For example, in 1999 the NHIS indicated that 5.4 percent of individuals were diagnosed with diabetes and in 2013 that figured increased by 3.9 percent, to 9.3 percent. Similar to the hypertension inconsistency results, as the number of inconsistent reports increased the percentage of inconsistent reports decreased. For example, 44.0 percent of individuals who indicated inconsistently, indicated their diabetes diagnosis inconsistently once, whereas only 7.6 percent of individuals inconsistently indicated their diabetes diagnosis seven times (see Table 2.1B). Overall, 11.9 percent of the individuals who indicated a diagnosis of diabetes, over the PSID years of interest provided, indicated at least one inconsistent response.

Psychological Problem Diagnosis

A descriptive statistical analysis of the weighted data from the biennial years ranging from 1999 to 2013, showed that the percentage of individuals who indicated that they had been diagnosed with a psychological problem gradually increased by 3.9 percent over time, from 5.2 percent in 1999 to 9.1

percent in 2013 (see Table 2.1C). When comparing the PSID against prevalence measures indicated from the NSDUH, the PSID percentages were higher. For example, in 2005 the NSDUH indicated that 4.9 percent of individuals were diagnosed with a psychological problem and in 2013 that figured increased by 2.0 percent, to 6.9 percent. Similar to both the hypertension and diabetes inconsistency results, as the number of inconsistencies increased, the percentage of inconsistent reports decreased. For example, 24.5 percent of individuals who inconsistently indicated their diabetes diagnosis, did so once. Whereas, only 7.1 percent of individuals inconsistently indicated their diabetes diagnosis seven times (see Table 2.1B). Finally, 14.0 percent of the individuals who indicated a diagnosis of a psychological problem, over the PSID years of interest provided, indicated at least one inconsistent response.

Table 2.1C. Diagnosable Chronic Health Conditions (Hypertension/Diabetes/Psychological Problem) Reported Inconsistently by Adult Respondents (Aged 20+) PSID Biennial Years 1999-2013, Weighted

		Health Conditions Inconsistent[a,b]				χ^2 statistic
	All	0 Conditions	1 Condition	2 Conditions	3 Conditions	
Number of Health Conditions Reported Inconsistently						
0 Conditions	61.1	n.a	n.a	n.a	n.a	
1 Conditions	29.4	n.a	n.a	n.a	n.a	
2 Conditions	8.3	n.a	n.a	n.a	n.a	
3 Conditions	1.2	n.a	n.a	n.a	n.a	
Proxy Status						
Always Self	42.5	65.5	27.4	6.2	0.9	454.0***
Always Proxy	21.3	68.7	25.8	5.0	0.6	
Mixed (Self/Proxy)	36.3	50.9	34.1	12.9	2.1	
Race-Gender						
Black women	6.6	47.7	38.5	12.5	1.3	502.2***
Black men	7.7	54.4	28.7	15.5	1.5	
White women	16.4	46.0	38.6	12.8	2.6	
White men	69.3	66.2	26.8	6.1	0.9	
Education						
<12 years	32.0	60.4	28.4	9.4	1.8	84.7***
=12 years	25.1	58.0	31.8	8.8	1.4	
13-15 years	18.5	60.7	29.8	8.7	0.8	
>16 years	24.4	65.4	27.8	6.0	0.8	
Age[c] (mean)	54.4	54.4	56.3	53.4	50.5	
Household Income Quintile						
First	20.0	45.9	39.8	11.2	3.1	678.4***
Second	20.0	51.7	32.7	13.2	2.3	
Third	20.0	57.7	31.6	9.7	1.0	
Fourth	20.0	65.6	26.1	7.8	0.5	
Fifth	20.0	72.2	23.6	3.7	0.5	
Marital Status						
Married	56.7	56.3	31.5	10.4	1.7	232.3***
Unmarried	43.3	67.0	26.8	5.6	0.6	
Homeownership						
Never a Homeowner	10.9	49.8	35.1	11.7	3.3	316.6***
Sometimes a Homeowner	39.9	56.9	31.6	9.6	1.8	
Always a Homeowner	49.2	66.7	26.4	6.5	0.3	
Number of Waves 1-8 (mean)	7.2	7.4	7.4	7.2	7.2	
Sample N (Persons)[d]	17,520		14,693			

Notes:

a. Percentage distribution unless otherwise noted.

b. Number of diagnosable health conditions (Hypertension, Diabetes, and/ or Psychological Problem) reported inconsistently at least once. It is possible for up to 7 total inconsistent reports per health condition.

c. Age is restricted to adult respondents 25 years old and older in 2005, so that they are at least 20 years old in 1999.
(*** p<0.001, ** p<0.01, * p<0.05, + p<0.1)

d. Difference due to missing values on inconsistent reporting or not enough waves observed to be able to detect an inconsistent report)

Source:

Panel Study of Income Dynamics (PSID) biennial years 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013

Self-Reports and Inconsistency

Results from this univariate analysis revealed that 61.1 percent of all individuals who were diagnosed with at least one of the health conditions of interest, consistently reported over time. 29.4 percent of individuals reported one health condition inconsistently, and only 8.3 percent and 1.2 percent of individuals reported inconsistently within two or three health conditions, respectively. In the PSID, individuals on average responded to 7.2 waves biennially between 1999 and 2013 (see Table 2.1A). In regards to proxy status, 42.5 percent of individuals reported they were always-self individuals, 21.3 percent were always-proxy individuals, and 36.3 percent were both self and proxy individuals. When comparing proxy status to number of health conditions (hypertension, diabetes and psychological problem) reported inconsistently, mixed (self and proxy) reporters had the highest percentage of individuals. Specifically, 34.1 percent of mixed-status individuals reported one health condition inconsistently, 12.9 percent of mixed-status individuals reported two health conditions inconsistently, and 2.1 percent of mixed-status individuals reported three health conditions inconsistently.

An analysis of inconsistent reports within diagnosed health conditions indicates that the number of inconsistent health conditions reported was significantly affected by individuals' educational attainment. Overall, 32.0 percent of individuals earned less than 12 years of education, 25.1 percent of individuals earned 12 years of education (High School Diploma/ GED), 18.5

percent of individuals earned 13 to 15 years of education (Some College-Associate's Degree), and 24.4 percent of individuals earned more than 16 years of education (Bachelor's Degree or higher). Individuals who did not earn a high school diploma or higher had a higher percentage of individuals who reported two or more health conditions inconsistently. 9.4 percent of individuals reported two health conditions inconsistently, and 1.8 percent of individuals with less than a high school diploma reported three conditions inconsistently. Those in the first income category had the highest percent of individuals who reported health conditions inaccurately. 39.8 percent of individuals in the first income category reported one health condition inconsistently, 11.2 percent of individuals reported two health conditions inconsistently, and 3.1 percent of individuals reported3 health conditions inconsistently.

Those who were married had a higher percentage of individuals who reported health conditions inconsistently. 31.5 percent of unmarried individuals reported one health condition inconsistently, 10.4 percent of married individuals reported two conditions inaccurately, and 1.7 percent of unmarried individuals reported3 health conditions inaccurately. Individuals who never owned a home had the highest percentage of inconsistent reports. 35.1 percent of individuals reported one health condition inconsistently, 11.7 percent of individuals reported two health conditions inconsistently, and 3.3 percent of individuals reported three conditions inconsistently never owned a home. The

mean age for all individuals diagnosed with a health condition was 54.4 years of age, and this mean age varied little across health condition inconsistency categories.

Multivariate Analyses- Response Inconsistency by Proxy Status & Race/Sex

The poison regression analysis of response inconsistency, of PSID adult individuals (aged 20 and older), found statistically significant difference in inconsistent response rate by proxy status, number of waves, age, income and marital status (see Table 2.2). In Model 1, when Mixed Self/Proxy individuals are compared to Always Self individuals, while holding the other variables constant in the model, the mixed respondent group are expected to have a rate 1.84 times higher for making an inconsistent report. For every increase in wave response, there is a .96 decrease in the rate ratio of inconsistent reports. The statistical significance for this result remained even when all controls were added to Model 4. In Model 2, White men (-0.59) had a significantly reduced rate ratio for inconsistent reporting when compared to Black women- this reduced rate ratio remained statistically significant even in the fully adjusted model.

Table 2.2 Association of Proxy Status with Number of Inconsistent Self-Reports by Adults Aged 20+ for Diabetes, Hypertension and Psychological Problem Diagnoses using a Poisson Regression (PSID Biennial Years)

	Model 1[b]		Model 2[c]		Model 3[d]		Model 4[e]	
Use of Proxy (Ref= Always Self)	IRR[a]	CI[a]	IRR[a]	CI[a]	IRR[a]	CI[a]	IRR[a]	CI[a]
Always Proxy	0.873*	(0.768 - 0.992)	1.011	(0.886 - 1.152)	0.991	(0.868 - 1.131)	1.069	(0.936 - 1.220)
Mixed (Self/Proxy)	1.840***	(1.674 - 2.022)	1.833***	(1.669 - 2.014)	1.745***	(1.586 - 1.920)	1.804***	(1.642 - 1.983)
Number of Waves (1-8)	0.959***	(0.938 - 0.981)	0.949***	(0.928 - 0.970)	0.977	(0.950 - 1.006)	0.966*	(0.940 - 0.993)
Race/Sex (Ref= Black Women)								
Black Men			0.869	(0.727 - 1.039)	0.867	(0.727 - 1.034)	1.033	(0.860 - 1.241)
White Women			0.907	(0.786 - 1.047)	0.983	(0.850 - 1.136)	1.042	(0.901 - 1.206)
White Men			0.588***	(0.517 - 0.669)	0.609***	(0.534 - 0.694)	0.845*	(0.731 - 0.978)
Age[g]					0.991***	(0.988 - 0.995)	0.990***	(0.987 - 0.994)
Education (Ref= <12 years)								
=12 years					1.043	(0.921 - 1.180)	1.076	(0.951 - 1.216)
13-15 years					0.940	(0.821 - 1.076)	1.058	(0.923 - 1.213)
16+ years					0.865*	(0.757 - 0.987)	1.160*	(1.010 - 1.332)
Income[f] (Ref=First)								
Second							0.828**	(0.724 - 0.946)
Third							0.636***	(0.557 - 0.726)
Fourth							0.604***	(0.524 - 0.697)
Fifth							0.410***	(0.351 - 0.480)
Marital Status (Ref=Married)							0.861**	(0.770 - 0.962)
Homeowner (Ref=Never)								
Sometimes							1.122	(0.975 - 1.291)
Always							1.106	(0.941 - 1.300)
N(Person Year)	113,222		113,222		113,222		113,222	
n(Person Level)	17,520		17,520		17,520		17,520	

Source: Panel Study of Income Dynamics 1999,

(*** p<0.001, ** p<0.01, * p<0.05, + p<0.1)

Notes: The unit of analysis for the findings in

a. Poisson regression model. 95% confidence intervals in brackets. Incidence Rate Ratios (IRR)

b. Adjusted for proxy status and number of waves.

c. Adjusted for proxy status, number of waves and one demographic characteristic.

d. Adjusted for proxy status, number of waves and three demographic characteristics.

e. Adjusted for proxy status, number of waves and six demographic characteristics.

f. Average Family Income, adjusted to 2013 inflation rate: 1($715.49 - $24,714); 2($24,735.26 - $38557.13); 3($38,566.52 - $55,659.28); 4($55,683.39 - $81,752.52); 5($81,753.18 - $1,558,047). Referent group: first (lowest) quintile.

g. Age is restricted to respondents who are at least 25 years old in 2005, so that they will be at least 20 years old in 1999.

In Model 3, when compared to Black Women, White men's rate ratio for inconsistent reports would be expected to decrease by a factor of 0.61, while holding all other variables in the model constant. For individuals who earned 16 or more years of education, the rate ratio for inconsistent reports would be expected to decrease by a factor of 0.87. The statistical significance for mixed proxy status, race/sex, age and education remained constant across all models, and number of waves statistical significance reappeared when other sociodemographic controls were added to Model 4. For income, when compared to a respondent in the first category[7], those in higher income brackets are considerably less likely to inconsistently report. The rate ratio for inconsistent reports for those in the second income bracket would be expected to decrease by a factor of 0.83; the third income bracket would be expected to decrease by a factor of 0.64; the fourth income bracket would be expected to decrease by a factor of 0.41; and the rate ratio for inconsistent reports for those in the fifth income bracket would be expected to decrease by a factor of 0.86. Lastly, if a respondent was married, then their rate ratio for inconsistent reports would be expected to decrease by a factor of 0.86, when compared to a respondent who were not married.

[7] Average Family Income, adjusted to 2013 inflation rate: 1($715.49 - $24,714); 2($24,735.26 - $38557.13); 3($38,566.52 - $55,659.28); 4($55,683.39 - $81,752.52); 5($81,753.18 - $1,558,047).

Discussion and Conclusion

Overall, results from these analyses support the first, but not the second hypothesis. Mixed self/proxy reporters had the highest rate of inconsistent reports when compared to always-self and always-proxy individuals. This variability in proxy reporting aligns with findings from Cigolle et al. (2018) where they too found that proxy status, wealth and age were predictors of inconsistency. To increase response consistency overtime, researchers should minimize the use of more than one household respondent, since we know who reports the disease diagnosis, has a significant impact on the validity and reliability of self-reported hypertension, diabetes and psychological problem diagnosis data.

These analyses also indicate that self-indicated diagnoses, as collected in the PSID's telephone computer-assisted interviews, are an inconsistent indicator of hypertension, diabetes and psychological problem prevalence. 41.9 percent of individuals in the household survey inconsistently indicated chronic health condition (see Table 2.1A). These finding align with all other major studies (e.g. (Cigolle et al. 2018; Johansson et al. 1999; Johnston, Propper, and Shields 2009) Specifically, Johnston et al. (2009) found a sizeable difference in the percentage of the individuals who indicated a hypertension diagnosis. Only 7 percent of individuals indicated a hypertension diagnosis, but 35 percent of individuals were medically diagnosed with the health condition.

Initial chi-squared analyses showed that response validity varied by race and sex as well as with self-reporters. We found that White men had a lower rate of inconsistent reports, with White men being most consistent in their disease diagnosis response over time. White men had the largest percentage of consistent reports (they also had the highest frequency)- followed closely by Black men. Specifically, for those who reported consistently, White men represented (66.2 percent), Black Men (54.4 percent), Black Women (47.7 percent), and White Women (46.0 percent) of individuals within their race/sex group who reported consistently (see Table 2.1A).

Yet, these findings do not exactly align with the inconsistency predictors of cardiovascular disease (CVD) and diabetes by Johansson, Hellénius, Elofsson, and Kraka's (1999). When self-reports were compared to medical diagnosis reports (objectively assessed outcomes), they found that women were more likely to underreport CVD and conversely men were more likely to be aware of their diagnosis status. They found gender to be a significant predictor of inconsistent reports with more women (71 percent) being unawareness of their hypertension when compared to men (56 percent). In this study, the comparison group was Black women and White men were significantly more consistent in their diagnosis reporting, using both race and gender can reshape our findings. Our findings were not perfectly aligned because Johansson et al. did not use an intersectional framework to compare race/sex groups. If they would have used an intersectional analytical framework, it could have brought

more clarity to what race women and men were more likely to misreport or be unaware of their health status.

In the Poisson regression models, once the controls for income, education and homeownership were used to evaluate the associations of response inconsistency, then the race/sex statistical significance disappeared (see Table 2.2). Response inconsistency was greatest for Mixed (Self/Proxy) reporters across the 8 waves of interest, and those in the Always-Proxy group had a decreased rate ratio of inconsistent reports (though not statistically significant). When compared to the lowest income bracket, all higher income brackets were found to have a decreased rate of misreporting. This is an inverse relationship where the rate of misreporting decreases as income increases. In Model 4, fully adjusted results indicated that race/gender differences did not hold in the misreporting of diagnosis, but income patterns emerged from the data on self-reported hypertension, diabetes and psychological problem diagnosis which align well with findings from Cigolle et al. (2018). They found decreased wealth to be a reliable predictor of increased inconsistent reports.

An intersectional framework was used to illuminate differences in diagnosis reporting by both race and sex. The intersectional analysis of the multivariate differences in reporting inconsistencies by race-gender were not found, which increases confidence in dissertation chapters three and four (physical and

mental health) self-report results. The lower incidence rate ratio of inconsistent self-reports among men than women might be associated with increased medical and community interventions/screening for men. The lack of differences by race may also be due to educational and other health outreach programs that have targeted racial minorities(Adams, Boscarino, and Galea 2006; Boden-Albala et al. 2014). In general, women access the health care system more frequently than men (Courtenay 2000). Therefore, it is theorized that women might be more cognizant of their health status and less likely to misreport contrary to our findings. A higher percentage of White men accurately reported but the highest percentage of 3 inaccurate health conditions misreports came from White women (3.5 percent) which aligns somewhat with Johansson et al. (1999). There were no significantly different results between Black and White women, the significant difference in decreased reporting variability was by number of waves, income and marital status of which all refer to a semblance of socioeconomic stability.

A major limitation of these findings is that we do not have access to medical reports for those who were diagnosed with a medical condition (hypertension, diabetes or psychological problem diagnosis). We do not know the exact date of diagnosis. This is important information because medical reports offer the date of initial diagnosis as well as any preventative measures or medication used to mitigate the harmful effects of the disease[8]. It is stipulated that time

[8] Everett and Zajacova (2015) found that the association between medical records and health care usage increased the validity of self-reported hypertension results because reports could be confirmed

from diagnosis increases inconsistency in self-reported disease diagnosis status. Other studies (Bowlin SJ, Morrill BD, Nafziger AN, Jenkins PL, Lewis C 1993; Chobanian 2010; Everett and Zajacova 2015) found that validity of self-reported hypertension, among adult individuals, who had not recently seen a doctor decreased significantly- thereby producing unreliable results. Specifically, (Everett and Zajacova 2015) found that as length of time increased diagnosis inconsistency increased regardless of race and gender. Overall, this prior research found that medical care utilization had a very strong impact on one's hypertension awareness and consequently increased the validity of their self-reported hypertension diagnosis.

Is the misreporting a lack of awareness of hypertension, diabetes and psychological problem diagnosis or something else? It is recommended here that further intersectional sensitivity analyses need to be conducted for the PSID (also incorporating Ethnicity) as well as for other nationally representative data sets. Cigolle et al. (2018) found a way to reconcile some of the misreporting in longitudinal data found in their study by examining and verifying the pattern in the inconsistent reports. This might be of some use to researchers who chose to use adjudicated data, but the use of self-reported disease diagnosis could be used as a proxy for disease prevalence- with reservation. Understanding its limitations and articulating this clearly may prime researchers and epidemiologists to discuss its reliability issues. Also,

with supporting use of hypertensive medication. Medication usage was used to classify Whites (26 percent) and Blacks (27 percent) as hypertensive.

preferably if possible, medical records should be used to further increase the validity of self-reporting measures.

Chapter 2 References

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Chapter 3: The Body: Katrina and Physical Health (Hypertension and Diabetes) Outcomes

Abstract

Background

The purpose of this research is to document changes in physical health outcomes for survivors of Hurricane Katrina using the Displaced New Orleans Resident Survey (DNORS) of adult survivors. This intersectional analysis proposes that Black women are most susceptible to physical health problem diagnosis, and due to the combined acute stress from the hurricane and the chronic stress that they may endure from race and sex related psychosocial risk factors like racism, sexism and classism, Black women will be more susceptible to post-Katrina physical health problem diagnosis.

Methods

Hypertension and diabetes diagnosis self-reports from 1,378 Displaced New Orleans Residents Survey (DNORS) individuals aged 30+ in 2009/10 were analyzed. Logistic regression and annual hazard analyses were used to measure the association between race/sex and physical health outcomes (hypertension and diabetes).

Results

These analyses tested the relationship between race and sex and physical health outcomes pre and post-Katrina. Black women were more likely to indicate negative physical health outcomes than their White or male

counterparts regardless of Hurricane Katrina. Thus, the first set of hypotheses were substantiated, but not the second set of hypotheses. This may be due to a considerable increase in adverse physical health outcomes across race and sex groups post-Katrina.

Conclusions

These findings align with previous research that evidence how chronic psychosocial stressors, emanating from preexisting low racial/sex status, increase poor physical health outcomes for Black women. But, environmental disasters may increase the likelihood of poor physical health outcomes for all survivors.

Key Terms

Black Women; Hurricane Katrina; New Orleans; natural disasters; hypertension; hypertension; diabetes, disparities; intersectionality, weathering, allostatic load

Introduction

The National Center for Health Statistics (NCHS) regularly provides life expectancy rates for Blacks and Whites, and in 2004, the life expectancy at birth for Blacks was 73.1 years compared to 78.3 years for Whites. According to Williams et al. (2010:2), "if Blacks could improve their life expectancy at the rate at which overall life expectancy increased in the United States between 1980 and 2000 (an average of 0.2 years annually), it would take them 26 years to close the current 5.2-year gap in life expectancy." Furthermore, data released by the Center of Disease Control and Prevention found that heart disease (was

the number one cause of death in 2017) and diabetes (was listed as cause number seven of death in 2017) was among the top ten leading causes of deaths in 2005, 2010, 2013, 2015, and 2017 (their most recent data). An estimated 108 million (45 percent) of U.S. adults have hypertension. In 2017, 647,457 Americans died from heart disease, and 83,564 Americans died from diabetes related complications. They found that (see Keppel et al. 2010 for a detailed analysis of racialized disparities in mortality rates) these diseases disproportionately affect racial minorities and sex appears to add a layer of complexity to the understanding of minority health outcomes. According to research on disparate physical health outcomes, Black women disproportionately suffer from hypertension and diabetes and are more likely to succumb to the deleterious effects of these and similar inflammatory diseases (Geronimus, Hiken, Keeene, and Bound 2006).

Increasingly, there is a growing interest in the relationship between psychosocial risk factors and health outcomes like excess body fat accumulation and inflammatory disease responses from the body (Epel Et al. 2001; McEwen & Gianaros 2010; Elenkov & Chrousos 1999; Groesz et al. 2012; Miller, Chen & Parker 2011; Miller Chen & Cole 2009). Because chronic inflammation may lead to diseases like asthma, diabetes, hypertension and even cancer- those who are stigmatized by their racial or gender status will be more likely to suffer from the negative effects of stress (Dandona &

Bandyopadhyay 2004; Donath 2011; Blonde 2010; Heitzer et al. 2001; Ross 1999; Stemberg et al. 1992; Wellen & Hotamisligil 2005; Yudkin et al. 2000).

Disaster, Katrina and Physical Health: Intersectional Disparities

Physical Impacts

The physical impact stage of disaster focuses on physical pathology, physical disorder or death immediately emanating from an event's destructive forces (Fothergill et al. 1999). Physical impact rates most often describe injuries to the physical body or number of deaths such as the mortality or morbidity rates of people who are affected by disasters like hurricanes, floods, earthquakes and droughts. Those who are most likely to incur the most physical damage (including death) from these environmental catastrophes are also most likely to live in geographically vulnerable areas. Such is the case for people who lived in economically depressed areas of New Orleans, and other regions that have been socio-politically and environmentally compromised (Labarthe 2005). Zoraster (2010) found that there were multiple anecdotal, post-Katrina reports of severe impact on those with hypertension, diabetes, end stage renal disease, chronic metabolic illnesses, and other chronic diseases, but this study found that chronic illnesses was more prevalent within lower socio-economic groups.

The majority of studies in this area often do not provide an analysis of racial and sex differences in physical health outcomes, but high-risk geographical

areas often have a disproportionately high percentage of marginalized population (Cutter 2006). Furthermore, the majority of research on physical impacts does not explicitly use an intersectional framework that considers racial/gender/class differences in physical health outcomes (Williams, Mohammed, Leavell and Collins 2010). In general, analyses of racial differences in physical health outcomes show that racial and ethnic minorities are more likely to experience negative consequences as a result of natural disasters when compared to the racial majority (Cutter et al. 2003). Fatality counts often indicate that disaster-connected deaths for racial minorities are disproportionately high (Sharkey 2007). For a historic example, Bates et al. (1963) found that a disproportionate number of Blacks died in Hurricane Audrey[9] where there was a 1 in 10 White to Black death ratio (e.g. 38 per thousand White people died whereas 322 per thousand Black people died). Current research provides evidence that these disparities still hold true. More recently, Zoraster (2010:76) reports that "once the demographics are corrected for age and race", Blacks are found to be disproportionately affected.

Hurricane Katrina was not merely a disaster, but a catastrophe (Quarantelli, 2006). Disasters often damage or destroy hospitals and other health care organizations, and Hurricane Katrina crippled the medical industrial complex in the Gulf Coast (Ford et al. 2006). According to Arrieta, Foreman, Crook,

[9] Hurricane Audrey occurred on June 25, 1957 flooding the Bay of Campeshe which is 460 miles south of Cameron Parish, Louisiana.

and Icenogle (2009:2), “federally funded community health centers (CHCs)—the safety net of the region’s underinsured and uninsured—sustained an estimated $65 million damage in Louisiana and Mississippi.” 32 percent of the 288 health center sites operating in 2004 were lost or severely damaged. They stipulated that the longer-term adverse health effects of the disaster would be significant and require the need for mental health care follow-up assessments would help survivors cope with chronic stress. Also, they found that survivors had an increased risk of major depression, and that depression was associated with an increased risk of hypertension, heart disease, and diabetes. Musselman and Nemeroff (2000) found that depression and anxiety disorders increase mortality rates.

Moreover, studies on the effects of perceived discrimination, for example, provide evidence that this psychosocial stressor is inversely related to poor mental and physical health outcomes (Bratter 2011; Brydon et al. 2004; McEwen & Gianaros 2010; Strike & Steptoe 2004). Research has also shown that internalized racism increases the likelihood of Black women having higher cortisol levels, insulin resistance, increased likelihood of being overweight, and having increased abdominal obesity (Pyke 2010; Chambers et al. 2004). They may suffer these health problems, because as most researchers postulate, people with relatively high levels of internalized racism have high levels of stress, which is believed to be related to the physiological pathways associated with excess body fat accumulation and inflammatory diseases

(Adam & Epel 2007; Adler &Rehkopf 2008; Black 2002; Epel et al. 2001; McEwen & Stellar 1993).

Interestingly, not all research supports this claim. For example, Vines et al. (2007) found that perceived racism was associated with lower waist-to-hip ratios among Black women in the United States which contradicts the findings from other studies (Adam & Epel 2007; Adler & Rehkopf 2008; Black 2002; Epel et al. 2001; McEwen & Stellar 1993). Although the assessment of race-related risk factors somewhat varied across these studies, the breadth of findings suggest that the salience of race-related beliefs and experiences may be related to not only excess body fat accumulation, but inflammatory disease as well as well (Amsterdam 2013; Hänsel et al. 2010). This is why this research is necessary. It is necessary because of the ever increasing prevalence of obesity and inflammatory disease in the Black population is not only detrimental to the Black community, but the nation at large. We need to understand factors that increase their propensity for inflammatory disease and this research will investigate those causes.

Weathering

Epidemiologic studies have frequently documented the adverse effects that psychosocial, environmental and socioeconomic instabilities have on the bodies of Black women. Studies have primarily focused on risks of adverse birth outcomes for Black women's children (Messer and Kaufman 2010). In doing so, epidemiologists used to paint a picture of newborn babies as ''blank

slates," but after using a race to frame their studies, they learned that the womb is an environment as well. The womb's environment may be more or less hospitable during pregnancy depending on a variety of factors and race has the ability to constrain a mother's access to adequate nutrition, stress levels, and exposure to environmental pollution. This has led to the development of a research theory on the ‘‘heritability of environmental conditions" (e.g. Luke et al. 2001).

Physiologically, Geronimus (1991) proposed that persistent acute and chronic stressors can have a profound effect on health. She proposed a theory that would help us understand why the patterns that she found in early health deterioration among Blacks were so persistent. This "weathering" hypothesis contends that because of chronic social, political and economic adversity, Blacks experience early health deterioration. The stress from living within a racist society (DuBois' (1903) theory on double consciousness captures the essence of this stressful process) is disadvantageous for Blacks' health. The weathering hypothesis allows us to understand the process through which racism gets under the skin. Geronimus (2006) found that this physiological deterioration led to an increase in Black morbidity and mortality rates that are similar to older White individuals who live in the same society, but do not have the added stress of living within a racial state (Goldberg 2002).

Mapping the Intersections of Physical Health Disparities

Racial disparities in health have been long noted in the United States (Williams 1999; Williams et al. 2010). In describing these disparities, this research will be attentive to how both race and gender may influence these outcomes. Scientists have sought to link biomarkers to social measures in an attempt to better understand the underlying physiological mechanisms of social disparities in health. Geronimus (1991, 2006) found that race and socioeconomic status affect cortisol levels, sympathetic nerve activity, blood-pressure reactivity, cytokine production, waist-to-hip ratio, and glycated hemoglobin levels.

Various forms of oppression build upon one another, thereby creating systems of oppression that intersect. Intersectional scholars contend that forms of oppression within society (e.g. racism, sexism, and classism) do not function independently of one another (Alexander-Floyd 2012; McCall 2005; Yuval-Davis 2006). McEwen et. al. (1998) created the concept 'allostatic load' which is the cumulative destruction of body's systems due to exposure to chronic stressors that may also be mutually deconstructive. In consideration of race, researchers have found differences between racial groups allostatic load scores. These differences are relatively small during early adulthood (between the ages of 18 to 25), but the gap increases shortly thereafter. The allostatic load gap between Blacks and Whites is the largest from the ages of 35 and 64 years (Geronimus et al. 2006). Furthermore, when considering both race and

gender, Black women in this age range have the highest allostatic load score when compared with Black men, or White men and women (Geronimus et al. 2006). These findings provide evidence that the impact of chronic stress is intersectional in nature, which is why an analysis of health disparities should also use an intersectional framework.

Hypotheses

H1: Black women will have the highest incidence of hypertension diagnosis by race and gender.

H2: Black women will have the highest incidence of diabetes diagnosis by race and gender.

H3: Following Hurricane Katrina, Black women will have the highest incidence of hypertension diagnosis by race and sex when comparing post-Hurricane Katrina versus pre-Hurricane Katrina rates.

H4: Following Hurricane Katrina, Black women will have the highest incidence of diabetes diagnosis by race and sex when comparing post-Hurricane Katrina versus pre-Hurricane Katrina rates.

It is proposed here that due to intersectional social inequalities Black women will have significantly higher odds of hypertension and diabetes diagnoses. It is also proposed that the Katrina event led to elevated incidence of physical health problems among those who were fortunate enough to survive this tragedy, but more so for racial and gender minorities who are ascribed with

low social status (Brunkard, Namulanda and Ratard 2008; Groen and Polivka 2008; Seeman, Karlamangla, Koretz, & Seeman 2014).Therefore, the Black women residents of New Orleans will be more likely to be disproportionately negatively affected by the acute stress of the hurricane event, since they were also presumably living with the chronic stress of racism, sexism and classism (Groen and Polivka 2008; Seeman, Karlamangla, Koretz, & Seeman 2014).

This research proposes that there should be an increase in the incidence of racial and gender disparities in physical disease diagnoses post-Katrina, when compared with the incidence of physical disease diagnoses pre-Katrina. This is predominately because Black women are presumed to suffer the chronic stress of racism, sexism, and classism, and with the addition of the acute stress of the hurricane event, which (according to this theory) would increase their likelihood of negative physical health outcomes when compared to their White/Male counterparts. Status syndrome theory proposes that low social status negatively impacts physical health outcomes, and using status characteristics theory we can predict that the process of stigmatization may create physical health outcome differences between Black and White New Orleanians who survived the wrath of Katrina.

Theoretically, Hurricane Katrina would have a negative effect on health outcomes which may increase racial and gender disparities in rates of physical health diagnosis for those who live within the intersections of race and gender.

This leads us to our research question: did Hurricane Katrina increase racial disparities in incidence physical health diagnosis? Using the aforementioned theoretical framework, it is hypothesized that, Hurricane Katrina will have led to racial and gender disparities in the rates of physical health diagnosis for Black women as status syndrome theory (Seeman, Karlamangla, Koretz, & Seeman 2014) and status characteristics theory (Phelan, Lucas, Ridgeway & Taylor 2013) predict.

Two outcome variables were used for this analysis. The first outcome variable was whether or not the individual had been diagnosed with hypertension and/or diabetes, which was followed up by a second question that asked individual how old they were when the diagnoses occurred. The second question as whether or not the individual had been diagnosed with diabetes, which was followed by a second question that asked how old the individual was when they were diagnosed (if they responded affirmatively to the first question).

Data and Methods

Displaced New Orleans Residents Survey

This research seeks to examine how socially constructed categories such as race, gender, class as well as other forms of systematic social inequality

informs physical health disparities. In order to evaluate whether or not and the degree to which physical health disparities may exist by race and gender, will use data from the Displaced New Orleans Residents Survey (DNORS). According to (Peterson, Sastry, Rendall, Ghosh-Dastidar, and Gregory, 2016), the DNORS sample frame consisted of Orleans Parish, Louisiana residents (this area overlaps geospatially with the City of New Orleans). Both returning pre-Katrina New Orleans residents and former New Orleans Residents who resettled in locations outside of the city were included in the study. DNORS data were used to construct pre-Katrina and post-Katrina diagnoses differences, in which the resulting weighted percentages and unweighted numbers were compared.

Methods

Although the DNORS is not panel data, the DNORS provides year of diagnosis for self-reported health diagnosis outcomes of residents of pre-Katrina New Orleans. We use this year of diagnosis data first to estimate annual hazards of being diagnosed in a given year, and second to conduct the logistic regression, as outlined previously in Chapter 1.

Annualized hazard ratios provide extremely important information about temporally associated incidents such as these analyses of chronic illness (hypertension/diabetes) diagnosis pre and post-Katrina. The annual hazard (conditional probability of diagnosis in year (x)) was found by calculating the number or individuals diagnosed with either hypertension or diabetes in year

(x) divided by the number with no diagnosis of the condition before year (x). The hazard ratio provides invaluable analytical insight into disease diagnosis rates, since it accounts for the *total* number of diagnoses in a particular year and time of diagnosis patterns.

To conduct the logistic regression, physical health diagnoses (hypertension or diabetes diagnoses) were used across a five-year exposure period. Sample A was constructed out of those who were diagnosed between 2005-2009/10 (post-Katrina) and were 30 years old and older, to be compared to those who had not been diagnosed before 2005-2009/10. Then, Sample B was constructed out of those who were diagnosed between 1999-2004 (pre-Katrina) and were 36 years old and older, to be compared to those who had not been diagnosed before 1999-2004. The 1999-2004 exposure period was used because it is an equidistant time period preceding the 2005-2009/10 post-Katrina period. The first model is the test of overall race-sex difference in being diagnosed with either hypertension or diabetes for hypotheses one and two, and the second model or the difference between No Diagnoses and 1999-2004 Diagnoses as well as No Diagnoses and 2005-2009/10 diagnoses categories, controlling for sociodemographic variables, produce the test of hypotheses three and four (descriptions of the sociodemographic variables may be found in Chapter 1). Generally, a limitation of the 1999-2004 "control group" exists because there are fewer diagnosis events in Sample A (1999-2004) which causes wider confidence intervals for Sample A (1999-2004) when compared to Sample B

(2005-2009/10) (see Appendix Table 3.1). Finally, to create income quintiles, we used equivalized household income (Burkhauser, Smeeding, and Merz 1996:385). To equivalize income, first we divide income by the square root of the number of members in the household (EI=I/√HHS). Thus in a single-person household equivalized income would equal household income and conversely equivalized income is expected to decrease as household size increases. Following the construction of equivalized income, it was then divided into quintiles.

All data analysis was performed using the statistical software- STATA.

Results

Univariate Descriptive Statistics of Hypertension and Diabetes Diagnosis for Samples A and B

Hypertension Univariate Descriptive Statistics

Table 3.1 provides weighted univariate descriptive statistics for physical health problems: hypertension and diabetes. The population represented by Sample A are aged 30 and older in 2009/10 and 36 and older for Sample B in 2009/10. The race and sex composition of the population represented by Sample A is as follows: Black women represent 27.6 percent, Black men 30.7 percent, White women 19.9 percent, and White men 21.8 percent of the population. Sample B is comprised of the following race and sex distribution: Black women represent 25.9 percent, Black men 31.7 percent, White women 18.5 percent, and White men 23.9 percent of the population. Education was

divided into the following categories: less than 12 years of education (less than a high education diploma), 12 years of education (a high education diploma or GED), 13 to 15 years of education (some college or an Associate's degree), and more than 16 years of education (a Bachelor's degree or higher). Both Sample A and B populations were highly educated- It is estimated that 40.4 percent earned more than 16 years of education in Sample A and 36.8 percent earned more than 16 years of education in Sample B. Sample A's mean population age was 48.2 years old, and in Sample B the mean population age was 47.0 years old. For the population represented by Sample A, its estimated that 35.8 percent were married, and 64.2 percent were not married. In Sample B, it is estimated that 39.1 percent of this population were married, while 60.9 percent were not married. In both Samples A and B it is estimated that the vast majority of both populations were religious, 61.1 percent in Sample A and 59.1 percent in Sample B. In Sample A, it is estimated that 31.2 percent of the population was very religious, and in Sample B, 32.1 percent of the population was very religious.

Diabetes Univariate Descriptive Statistics

The diabetes diagnosis race and sex composition for the population represented by Sample A is as follows: Black women represent 30.3 percent, Black men 30.8 percent, White women 17.4 percent, and White men 21.5 percent of the population. Sample B is comprised of the following race and sex population distribution: Black women represent 29.2 percent, Black men 31.8 percent,

White women 16.5 percent, and White men 22.4 percent of the population in Sample B. Both Samples A and B corresponding populations were highly educated, 38.6 percent had 16+ years of education in Sample A and it is estimated that 36.0 percent had 16+ years of education in Sample B. The mean age for Sample A was 50.8 years and the mean age for Sample B was 48.5 years. Of those diagnosed with diabetes in Sample A, it is estimated that 35.6 percent of this population were married, and 64.4 percent were not married. In Sample B, 38.8 percent of this population was married, and 61.2 percent were not married. In both Samples A and B, the population estimates indicate individuals were religious, 61.1 percent of Sample A and 59.0 percent of Sample B. In Sample A, it is estimated that 31.8 percent of the population was very religious, and in Sample B, 33.3 percent were very religious.

Bivariate Analyses of Hypertension and Depression Diagnosis by Samples A and B

Hypertension Bivariate Analyses

Table 3.1 provides initial results for F-tests of the diagnoses of physical health problems (i.e. hypertension and diabetes) for all individuals by pre/post-Katrina diagnosis. An F-test revealed no statistically significant difference in diagnosis for all individuals between the two time periods, when the 23.6 percent of those diagnosed with hypertension between 2005 and 2009/10 were compared to the 20.3 percent diagnosed between 1999 and 2004. For both

Samples A and B, the highest percentage of those who were diagnosed with hypertension had less than 12 years of education with 30.1 percent and 33.9

Table 3.1 New Orleans Adults Ages 30+ at the end of five-year periods immediately before and immediately after Hurricane Katrina, Weighted Statistics

	Hypertension Univariate Descriptive Statistics[a]		% Diagnosed with Hypertension in the period[b]		F-Test 2005-2009/10 vs. 1999-2004 P-Value	Diabetes Univariate Descriptive Statistics[a]		% Diagnosed with Diabetes in the period[b]		F-Test 2005-2009/10 vs. 1999-2004 P-Value
	2005-2009/10	1999-2004	2005-2009/10	1999-2004		2005-2009/10	1999-2004	2005-2009/10	1999-2004	
All			23.6	20.3	0.250			7.4	5.4	0.153
Race-Gender										
Black women	27.7	25.9	25.5	27.3		30.3	29.2	9.7	9.4	
Black men	30.8	31.7	35.0	24.0		30.8	31.8	9.9	6.5	
White women	19.7	18.5	11.8	9.2		17.4	16.5	3.5	1.5	
White men	21.9	23.9	15.7	18.2		21.5	22.4	3.8	1.8	
Education[c]										
<12 years	12.6	14.8	30.1	33.9		14.3	16.3	7.5	13.5	
=12 years	20.5	22.2	28.3	21.6		21.9	22.9	10.9	3.5	
13-15 years	26.5	26.2	21.0	19.0		25.2	24.8	4.8	5.0	
>16 years	40.4	36.8	20.8	15.3		38.6	36.0	7.2	3.2	
Age (mean[d])	51.6	47.0				50.8	48.5			
Equivalized Household Income Quintile[ef]										
First	20.0	20.0	22.2	22.4		20.0	20.0	5.1	7.8	
Second	20.0	20.0	27.4	16.9		20.0	20.0	13.0	4.8	
Third	20.0	20.0	28.2	22.7		20.0	20.0	5.6	6.4	
Fourth	20.0	20.0	21.4	21.7		20.0	20.0	7.8	6.8	
Fifth	20.0	20.0	18.7	18.8		20.0	20.0	5.9	1.5	
Marital Status[c]										
Married	35.8	39.1	22.5	19.0		35.6	38.8	8.7	6.5	
Unmarried	64.2	60.9	24.2	21.1		64.4	61.2	6.7	4.7	
Religiosity[c]										
Not religious	7.7	8.8	12.9	17.0		7.1	7.7	4.6	2.1	
Religious	61.1	59.1	23.8	19.5		61.1	59.0	6.4	3.5	
Very religious	31.2	32.1	26.1	23.1		31.8	33.3	9.9	9.7	
Sample N	746	598	733	587		981	864	962	848	

Notes:

a. Percentage distribution unless otherwise noted

b. Among those not diagnosed with condition at start of 5-year period

c. Observed at 2009/10 survey

d. For 1999-2004, Age = Age in 2009/10 - 6 years

e. Hypertension Income Referent groups. Referent group: first (lowest) quintile.

2005-2009/10 Diagnosis: 1(0-10,733), 2(10,970-20,821), 3(21,000-32,240), 4(32,527-51,962), 5(53,000-300,000).

1999-2004 Diagnosis: 1(0-12,728), 2(13,000-24,000), 3(24,042-38,184), 4(38,890-64,000), 5(65,000-300,000).

f. Diabetes Income Referent groups. Referent group: first (lowest) quintile.

2005-2009/10 Diagnosis: 1(0-13,000), 2(13,229- 23,094), 3(23,255- 37,477), 4(37,500- 63,509), 5(63,640- 300,000).

1999-2004 Diagnosis: 1(0-12,728), 2(13,000-24,000), 3(24,042-38,184), 4(38,683-64,000), 5(65,000-300,000).

Source:

2009/10 Displaced New Orleans Residents Survey of those who were living in the City of New Orleans in 2005 just before Katrina struck.

percent respectively. Marriage was evenly distributed amongst categories, 22.5 percent Sample A and 19.0 percent in Sample B were married, while 24.2 percent in Sample A and 21.1 percent in Sample B were not married. 12.9 percent of Sample A and 17 percent of Sample B estimated individuals were religious, 23.8 percent of Sample A and 19.5 percent of Sample B estimated individuals were religious, while 26.1 percent of Sample A and 23.1 percent of Sample B estimated individuals were very religious.

Diabetes Bivariate Analyses

The F-test for diabetes (Table 3.1) also revealed no statistically significant difference in diagnosis between the two time periods, when the 7.4 percent of those diagnosed with diabetes between 2005 and 2009/10 were compared to the 5.4 percent diagnosed between 1999 and 2004, respectively. The population represented by Sample A, earned 16+ years of education, 7.2 percent were diagnosed between 2005 through 2009/10, and 3.2 percent of the population represented by Sample B were diagnosed with diabetes between 1999 through 2004. Regarding marital status estimates, 8.7 percent of the population represented by Sample A and 6.5 percent of the population represented by Sample B were married, while 6.7 percent of Sample A and 4.7 percent of Sample B populations were not married. In terms of religiosity estimates, 4.6 percent of the population represented by Sample A and 2.1 percent of the population represented by Sample B indicated they were not religious, 6.4 percent of the population represented by Sample A and 3.5

percent of the population represented by Sample B indicated they were religious, and 9.9 percent of the population represented by Sample A and 9.7 percent of the population represented by Sample B indicated they were very religious.

Annual Hazard Analyses of Hypertension and Diabetes Year of Diagnosis

Hypertension Yearly Hazard of Diagnosis

To view trends in hypertension diagnosis, before conducting multivariate statistical analyses, the annual hazard for all persons aged 30 and older was conducted. The annual hazard of being diagnosed with hypertension increased dramatically following 2005, which shows the effect Hurricane Katrina had on this population of New Orleanians aged 30 and higher (see Figure 3.2A). The annual hazard of being diagnosed with hypertension by race and gender, following Hurricane Katrina in 2005, was also evaluated. The visual inspective indicates substantial increases in the annual hazard of being diagnosed with hypertension for all race/sex groups, excluding White women (see Figure 3.2B). The annual hazard or the probability of being diagnosed versus no diagnosis of the condition before 2005 was often higher for Black women, and all race and sex groups experienced a dramatic increase immediately following 2005. This trend continues until 2008[10] when the

[10] DNORS survey months were between June 2009 and May 2010, so hazard analyses were produced to 2008 since this is the last full year of diagnosis history.

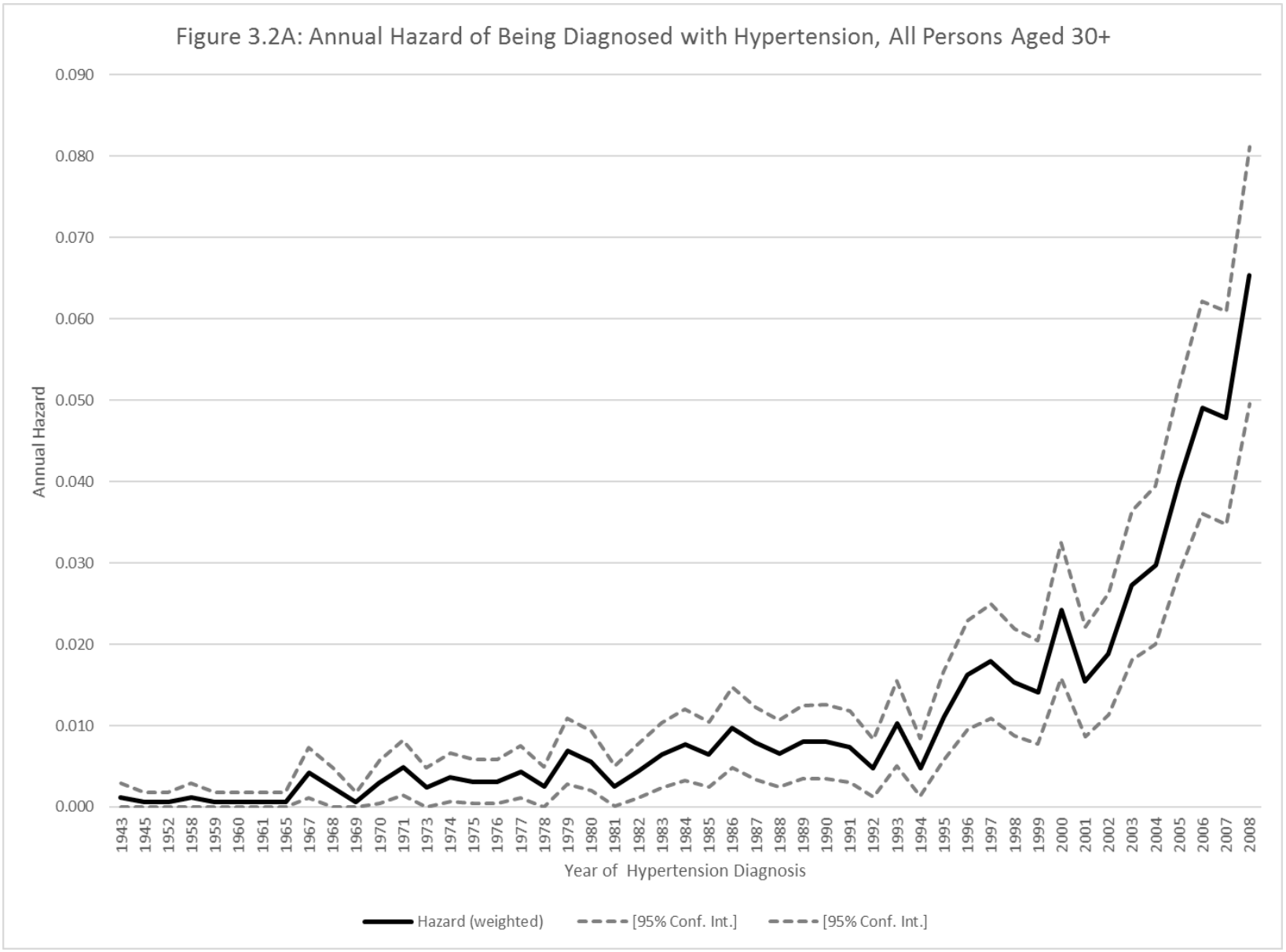


Figure 3.2A: Annual Hazard of Being Diagnosed with Hypertension, All Persons Aged 30+
0.090
0.080
0.070
0.060
0.050
0.040
0.030
0.020
0.010
0.000
Annual Hazard
1943 1945 1952 1958 1959 1960 1961 1965 1967 1968 1969 1970 1971 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008
Year of Hypertension Diagnosis
Hazard (weighted)
[95% Conf. Int.]
[95% Conf. Int.]

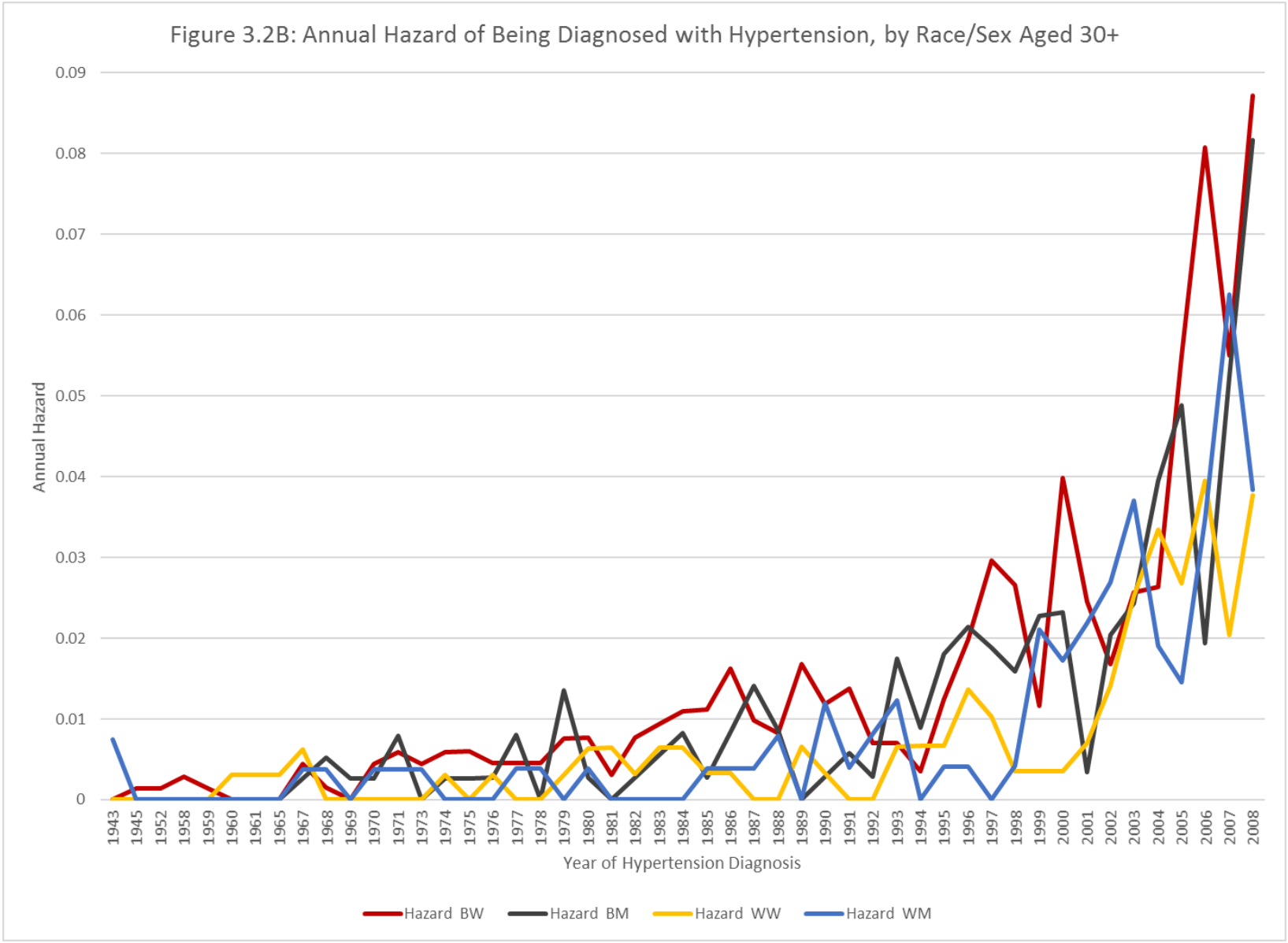


Figure 3.2B: Annual Hazard of Being Diagnosed with Hypertension, by Race/Sex Aged 30+
Annual Hazard
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1943 1945 1952 1958 1959 1960 1961 1965 1967 1968 1969 1970 1971 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008
Year of Hypertension Diagnosis
Hazard BW
Hazard BM
Hazard WW
Hazard WM

probability of being diagnosed with hypertension versus no diagnosis of hypertension before 2008 peaks by race. Black women and men have markedly higher rates of diagnosis when compared visually to their White counterparts. Results show that sex does not appear to influence disparity in diagnosis as much as race for those who indicated a hypertension diagnosis. It appears the annual hazard for Black men increased in tandem with the increase in hypertension diagnoses for Black women.

Diabetes Yearly Hazard of Diagnosis

The annual hazard of being diagnosed with diabetes reflects substantial increases for all individuals following Hurricane Katrina in 2005, as did hypertension (see Figure 3.2C). The annual hazard analysis shows that diabetes diagnoses increased dramatically post Katrina (2005) and peaked in 2008. This is graphical evidence that shows the negative effect that hurricane Katrina had on DNORS individuals. Following the annual hazard analysis for all persons aged 30 and over, we analyzed the annual hazard by race and gender. The visual inspective found that the annual hazard for diabetes diagnosis for Black women increased the most (see Figure 3.2D). It appears as though there was a at least a substantial increase between 2005 and 2008. No other racial sex group's diabetes diagnosis increased this dramatically. Though annual hazards increased for all race and sex groups, it was less so for White women and Black and White men. It appears the annual hazard rates for all

Figure 3.2C: Annual Hazard of Being Diagnosed with Diabetes, All Persons Aged 30+

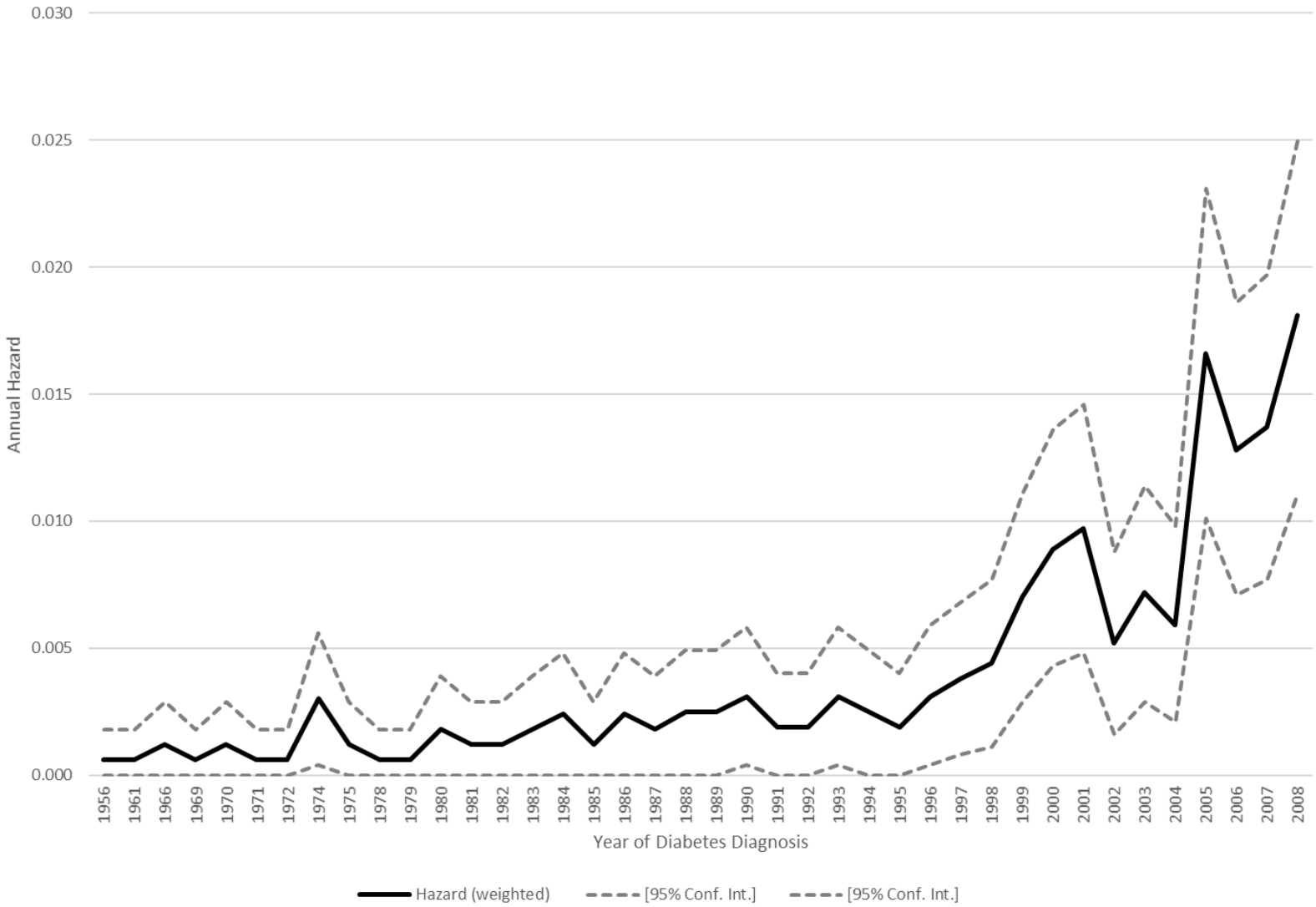
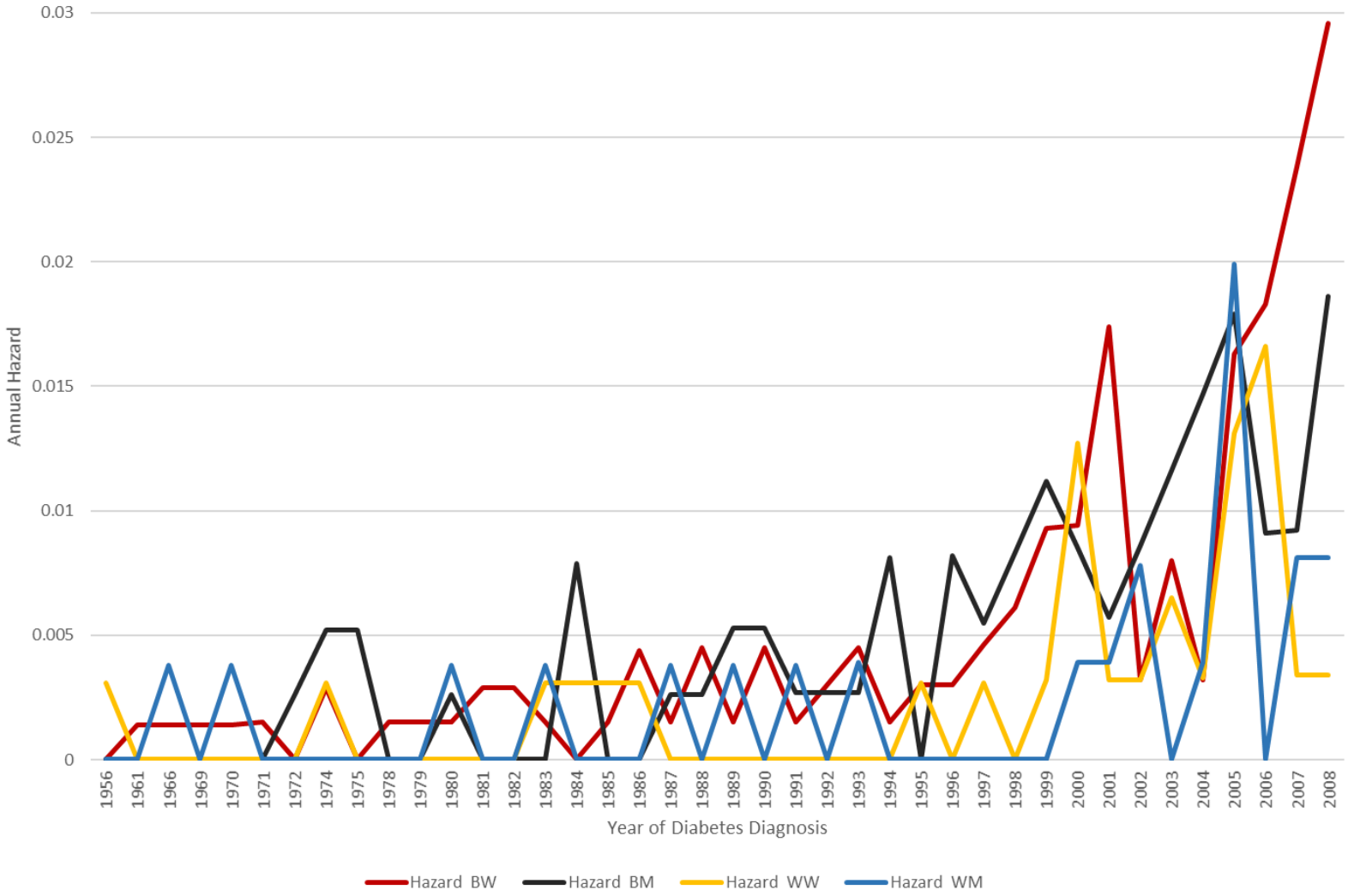


Figure 3.2D: Annual Hazard of Being Diagnosed with Diabetes, by Race/Sex Aged 30+



the other race and sex groups only increased to about a third of that of Black women's annual hazard rate in 2008.

Multivariate Analyses: Logistic Regressions Predicting Hypertension and Diabetes Time of Diagnosis

Hypertension Time of Diagnosis

Sample A: Diagnosed 2005-2009/10 vs. No Diagnosis (Age 30+)

The logistic regression analyses for hypertension diagnosis indicated statistically significant results and provided odds ratios (OR) that reflect disparity, as hypothesized. Model 1 (Table 3.3A) is an unadjusted analysis of time of hypertension diagnosis of Sample A which indicates statistically significant results by race and gender. Diagnoses for hypertension appear to be racialized, with Whiteness being a protective factor. The odds of being diagnosed for White women and White men are 60.7 percent and 45.4 percent lower than that of Black women, respectively. In the fully adjusted model (Table 3.3 A-Model 2), results again indicate that race is a protective factor since White Women had a 75.3 percent decreased odds and White men had a 60.4 percent decreased odds when compared to Black women for hypertension diagnosis even after controlling for sociodemographic variables like education, age, income, marital status, and religiosity. Age is also a predictor of diagnosis for every year increase in age there is a 3.9 percent increase in the odds of diagnoses.

Table 3.3A. Logistic Regression for Hypertension: Sample A (30+) No Diagnosis vs. (1999-2004) and Pre-Katrina Diagnosis and Sample B (36+) No Diagnosis versus (2005-2009/10) Post-Katrina Diagnosis (Weighted)

Variables	Sample A (No Diagnosis vs. Diagnosed 2005-2009/10 (30+)				Sample B (No Diagnosis vs. Diagnosed 1999-2004 (36+)			
	Model 1[c]		Model 2[d]		Model 3[c]		Model 4[d]	
	OR[a]	CI[a]	OR[a]	CI[a]	OR[a]	CI[a]	OR[a]	CI[a]
Race/Sex (Ref=Black Women)								
Black Men	1.577+	(0.938 - 2.652)	1.566	(0.882 - 2.780)	0.840	(0.437 - 1.614)	0.742	(0.362 - 1.521)
White Women	0.393**	(0.219 - 0.704)	0.257***	(0.137 - 0.482)	0.270***	(0.127 - 0.573)	0.184***	(0.0793 - 0.427)
White Men	0.546*	(0.301 - 0.992)	0.396**	(0.204 - 0.768)	0.590	(0.303 - 1.150)	0.430+	(0.183 - 1.007)
Age			1.039***	(1.022 - 1.055)			1.049***	(1.025 - 1.074)
Education (Years) (Ref=<12 years)								
= 12 years			1.095	(0.512 - 2.342)			0.567	(0.241 - 1.334)
13-15 years			0.737	(0.353 - 1.538)			0.420+	(0.168 - 1.049)
16+ years			1.291	(0.498 - 3.344)			0.326*	(0.132 - 0.809)
Income (Ref=First)[b]								
Second			1.615	(0.734 - 3.555)			0.921	(0.369 - 2.300)
Third			1.803	(0.772 - 4.210)			1.986	(0.771 - 5.117)
Fourth			1.393	(0.564 - 3.440)			2.330+	(0.905 - 6.002)
Fifth			1.575	(0.609 - 4.074)			2.745*	(1.051 - 7.170)
Marital Status (Ref=Married)			1.240	(0.796 - 1.932)			1.281	(0.708 - 2.319)
Religiosity (Ref=Not Religious)								
Religious			1.491	(0.576 - 3.857)			0.777	(0.192 - 3.141)
Very Religious			1.311	(0.481 - 3.569)			0.765	(0.174 - 3.362)
Sample (N)	746		733		598		587	

(*** p<0.001, ** p<0.01, * p<0.05, + p<0.1)

Notes: The unit of analysis for the findings in Table 3.3A is the individual respondent.

a. 95% confidence intervals in brackets. Odds Ratio (OR)

Multinomial Logistic Regression model (weighted)

b. Income is Equivalized Household Income, see Table 3.1 for quintile cut points.

c. Unadjusted logistic regression by race and sex

d. Adjusted regression by race and sex and sociodemographic characteristics

Source:

2009/10 Displaced New Orleans Residents Survey

Sample B: Diagnosed 1999-2004 vs. No Diagnosis (Age 36+)

Again, the weighted logistic regression analyses for hypertension diagnosis indicated statistically significant results and provided odds ratios (OR) that reflect disparity, as hypothesized. Model 3 (Table 3.3A) is an unadjusted analysis of time of hypertension diagnosis of Sample B which indicates statistically significant results by race and gender. White women's odds of diagnosis when compared to Black women were decreased by 73.0 percent. Neither Black nor White men had statistically significantly different odds of being diagnosed with hypertension when compared to Black women. In the fully adjusted model, even after controlling for sociodemographic variables like age, education, income, marital status, and religiosity, White women still have significantly decreased odds of diagnosis. White women have 81.6 percent decreased odds of diagnosis when compared to Black women diagnosed during this time. White men have a 57.0 percent decreased odds of diagnosis when compared to Black women, though this is only significant at the .10 level.

Again, age was also a statistically significant predictor of diagnosis in this model, for every year increase in age there is a 4.9 percent increase in the odds of diagnoses. Individuals with 13 to 15 years of education have a significantly decreased odds of diagnoses. Their odds of diagnosis were decreased by 58 percent when compared to those with less than 12 years of education.

Individuals in the fourth or fifth income quintiles have significantly increased odds of diagnosis when compared to those in the first income quintile. Those in the fourth income quintile have 133 percent higher odds of diagnosis ($p < .10$), and individuals in the fifth income quintile have 174.5 percent higher odds of diagnosis when compared to those in the first income quintile ($p < .05$).

Diabetes Time of Diagnosis

Sample A: Diagnosed 2005-2009/10 vs. No Diagnosis (Age 30+)

Model 1 is an unadjusted analysis of time of diabetes diagnosis by race and gender. This analysis revealed that race is highly correlated with diagnosis. White women and men have significantly reduced odds of diabetes diagnosis when compared to Black women (see Table 3.3B-Model 1). Specifically, White women had a 66.1 percent reduced odds of diagnosis and White men had a 63.3 reduced odds of diagnosis, when compared to Black women diagnosed during this period of time. In the fully adjusted model, race, age and income produced significantly different odds of diagnosis. White women (-74.9 percent) and White men (-63.3 percent) had lower odds of being diagnosed when compared to Black women (see Table 3.3B-Model 2). Every year increase in age increased the odds of diagnosis by 3.5 percent. When compared to those in the first income quintile, odds of diagnosis for the second income quintile increased by 242.8 percent.

Table 3.3B. Logistic Regression for Diabetes: Sample A (30+) No Diagnosis vs. (1999-2004) and Pre-Katrina Diagnosis and Sample B (36+) No Diagnosis versus (2005-2009/10) Post-Katrina Diagnosis (Weighted)

Variables	Sample A (30+) (No Diagnosis vs. Diagnosed 2005-2009/10)				Sample B (No Diagnosis vs. Diagnosed 1999-2004 (36+)			
	Model 1[c]		Model 2[d]		Model 3[c]		Model 4[d]	
	OR[a]	CI[a]	OR[a]	CI[a]	OR[a]	CI[a]	OR[a]	CI[a]
Race/Sex (Ref=Black Women)								
Black Men	1.020	(0.506 - 2.058)	1.013	(0.455 - 2.255)	0.675	(0.305 - 1.496)	0.595	(0.244 - 1.448)
White Women	0.339*	(0.122 - 0.941)	0.251**	(0.0917 - 0.687)	0.148**	(0.0469 - 0.466)	0.202**	(0.0611 - 0.669)
White Men	0.367*	(0.150 - 0.902)	0.266**	(0.0980 - 0.721)	0.181*	(0.0340 - 0.957)	0.243	(0.0323 - 1.821)
Age			1.035*	(1.008 - 1.063)			1.029+	(0.998 - 1.060)
Education (Years) (Ref=<12 years)								
= 12 years			1.718	(0.647 - 4.560)			0.226*	(0.0678 - 0.753)
13-15 years			0.711	(0.265 - 1.907)			0.339*	(0.119 - 0.964)
16+ years			1.561	(0.366 - 6.664)			0.324	(0.0785 - 1.336)
Income (Ref=First)[b]								
Second			3.428*	(1.155 - 10.18)			0.720	(0.222 - 2.338)
Third			1.194	(0.324 - 4.397)			1.332	(0.312 - 5.694)
Fourth			1.891	(0.488 - 7.331)			1.513	(0.322 - 7.109)
Fifth			1.922	(0.467 - 7.921)			0.486	(0.0597 - 3.947)
Marital Status (Ref=Married)			0.751	(0.402 - 1.402)			0.507+	(0.233 - 1.105)
Religiosity (Ref=Not Religious)								
Religious			0.946	(0.227 - 3.937)			0.522	(0.0798 - 3.415)
Very Religious			1.232	(0.290 - 5.241)			1.253	(0.173 - 9.074)
Sample (N)	981		962		864		848	

(*** p<0.001, ** p<0.01, * p<0.05, + p<0.1)

Notes: The unit of analysis for the findings in Table 3.3B is the individual respondent.

a. 95% confidence intervals in brackets. Odds Ratio (OR)
Multinomial Logistic Regression model (weighted)

b. Income is Equivalized Household Income, see Table 3.1 for quintile cut points.

c. Unadjusted logistic regression by race and sex

d. Adjusted regression by race and sex and sociodemographic characteristics

Source:

2009/10 Displaced New Orleans Residents Survey

Sample B: Diagnosed 1999-2004 vs. No Diagnosis (Age 36+)

Results from the unadjusted model (Table 3.3B- Model 3) indicate that race, was a significant factor in diabetes diagnosis. White women had 85.2 percent decreased odds of being diagnosed when compared to their Black women counterparts during this time. White men had 81.9 percent decreased odds of being diagnosed when compared to their Black women counterparts during this time. In the fully adjusted model, race, age, education and marital status are significant predictors of diagnosis. Specifically, White women have 79.8 percent decreased odds of diagnosis when compared to Black women. For every year increase in age, the odds of diagnosis increases by 2.9 percent ($p < .10$). Those with twelve years of education have 77.4 percent reduction in odds of diagnosis and individuals with 13 to 15 years of education have a 66.1 percent reduction in odds of diagnosis when compared to those with less than 12 years of education. For unmarried individuals, they have a 50.3 percent reduction ($p < .10$) in odds of diagnosis when compared to their married counterparts.

Discussion/Conclusion

The hazard analyses (which are more sensitive to temporal change in diagnoses when compared to the logistic regression analyses) were able to detect and illuminate the substantial increase in physical illness rates among Hurricane Katrina survivors that continued to elevate until 2008- especially so for Black women. The Black women who were strong enough to survive Hurricane Katrina, one of the most catastrophic natural disasters to date, had

lingering ill health effects (Zoraster 2010). Virtually all studies describe these Black women as victims- poor, single mothers, who were incapacitated by the storm (Luft 2008). But here, they are described as survivors. They were often forced to save their families, including their children, from this catastrophe (Frymer, Strolovitch, and Warren 2006). Research corroborates- that they had to make a way out of no way- often at the expense of their own health (Kessler et al. 2007). Previous research on physical health disparities for Hurricane Katrina survivors heavily relied on data that drew different pre-and post-Hurricane Katrina samples. But the strength of this data lies in its post Katrina sample, drawn from survivors who lived in the New Orleans area at the time of the hurricane. The data allowed us to contrast the time of diagnosis for the physical health outcomes (hypertension and diabetes). This provides us with strong evidence and substantial support for Katrina survivors racially disparate and declining health outcomes that most likely emanated from a chronic pre-Katrina environment.

Hurricane Katrina related stress can be found to not only have an adverse effect on physical health outcomes, but also had lingering adverse effect on physical health outcomes- on all race/sex groups. Hurricane Katrina is associated with a ripple effect in the health outcomes of survivors. These findings support earlier research which found that housing loss and property damage coincided negative health outcomes for Hurricane Katrina survivors following the storm (Fussell, Sastry, and Vanlandingham 2010). Logistic regression results indicated that statistically significant differences in

hypertension diagnosis exist, primarily by race, when compared to those who received no diagnosis of hypertension or diabetes. Race/sex, education, income and age were found to have statistically significant differences in diagnosis of hypertension. These findings extended to the diabetes diagnosis as well. While the models predicted decreased odds of being diagnosed with hypertension and diabetes especially for White women, but also for White men. It wasn't until the annual hazard analyses were conducted that we can see visually in Figure 3.2A that the differences in diagnosis by year was so stark for Black women. The hazard analysis was sensitive enough to pull out the entangled time of diagnosis by hypertension and diabetes for individuals who increased in age following this catastrophic event. Although previous studies showed that increased income had a protective effect on physical health outcomes (Fussell et al. 2010), this study also found much evidence to substantiate this when both race and sex were taken into consideration using this intersectional analytical framework.

Hurricane Katrina was such a destructive force that the damage was catastrophic and diffuse. This storm was like a bull in a china shop and it infected everything in its path with destruction. Those who were geographically insulated from the storm lived on higher ground, but the hurricane induced stress touched them ever so slightly as well. The implications for this research extend beyond analysis into the medical or health care field. Post-disaster care should be ongoing! Often, care is

established for immediate health concerns, like fractures and trauma, but this is not enough. Disaster survivors, (let us extend this also to other Groups who inhabit the margins of their particular society) who are extremely marginalized, should be checked for hypertension and diabetes (as well as other chronic diseases 5, 10 and even twenty years) from the event of the storm. Further studies should also evaluate these physical health trends for the children of the Black women, who were most often the primary providers for their children, to see if these Hurricane-stress effects can be found in their future health outcomes as well.

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Chapter 4: The Mind: Hurricane Katrina and Mental Health (Emotional Problem and Depression) Outcomes

Abstract

Background

The purpose of this research is to document changes in mental health outcomes for survivors of Hurricane Katrina using the Displaced New Orleans Resident Survey (DNORS) of adult (30+) survivors. Using an intersectional framework, the disaster distress from Hurricane Katrina, and the chronic stress from race and sex related psychosocial risk factors (e.g. racism, sexism and classism) may result in increased health disparity.

Methods

Emotional Problem and Depression diagnosis self-reports from 1,378 Displaced New Orleans Residents Survey (DNORS) individuals were analyzed. Logistic regression and annual hazard analyses were used to measure the association between race/sex and chronic stress and mental health outcomes (emotional problems and depression).

Results

There was some suggestion of greater emotional problem diagnosis among Black and White women than for Black and White men. However, in multivariate analyses Black women were not more likely to report a diagnosis

of negative emotional problem and depression post-Katrina when compared to their White or male counterparts. There were increased adverse mental health outcomes across all race and sex groups.

Conclusion

These findings do align with previous research on chronic psychosocial stressors, which show that when coupled with environmental disaster, mental health disparity increases for those with low racial/sex status. Additionally, this research articulates the body of literature on the relationship between mental health disparity, with research on acute stressors (e.g. environmental disasters), for socially vulnerable groups.

Key Terms

Black women; Hurricane Katrina; New Orleans; intersectionality, natural disasters; depression; mental health problems, stress, mental health disparities; social vulnerability

Introduction

The relationship between racial or sex based stratification and disparate health outcomes have been well documented. But, the effect that chronic social inequality and acute stress (e.g. a natural disaster) has on poor mental health outcomes by race and gender, needs more study (Adams and Boscarino 2005). America's historical roots have systematized racial stratification through the caste-like use of ascribed characteristics and traits (Cox 1948), and it is

proposed here that catastrophic events increase those disparities. Thus, natural disasters cause environmental destruction, and simultaneously may increase disparity within society as well. The beginning of this chapter will discuss previous research on the relationship between disaster trauma and distress.

Next, a review of prevailing health pattern theories will proceed the analysis of mental health outcomes by race and gender. The analysis will test whether preceding patterns of health disparity- by race and gender- remain disparate post disaster trauma. To test this temporal relationship, the association between race and sex and mental health disparity will be conducted before and after the treatment or Hurricane Katrina disaster event. This study will simultaneously analyze, using an intersectional framework, concurrent racial and sex patterns of mental health diagnosis, before and after the Katrina treatment event, to determine if any patterns remain, and to what extent using DNORS data. Ultimately, it is argued here that by using an intersectional analysis we may be able to uncover patterns or mental health outcomes for socially vulnerable groups that otherwise might have been overlooked.

Disaster, Katrina and Mental Health: Intersectional Disparities

Hurricane Katrina was not merely a disaster, but a catastrophe (Quarantelli, 2006). Disasters often damage or destroy hospitals and other health care organizations, and Hurricane Katrina was no exception. Katrina crippled the medical industrial complex in the Gulf Coast (Ford et al. 2006). According to

Arrieta, Foreman, Crook, and Icenogle (2009:2), "federally funded community health centers (CHCs)—the safety net of the region's underinsured and uninsured—sustained an estimated $65 million damage in Louisiana and Mississippi." 32 percent of the 288 health center sites operating in 2004 were lost or severely damaged. Since they found that survivors had an increased risk of major depression, the research team stipulated that the longer-term adverse health effects from the disaster would be significant and require the need for mental health care follow-up assessments to help survivors cope with stress. Yet, the reduced access to health care resources was problematic for the most socially vulnerable groups since their medical infrastructure was damaged.

Psychological Impacts

> *"Humans act toward things on the basis of the meanings they ascribe to those things... meaning is derived from the social interaction that one has with others and society..., and these meanings are …modified through an interpretative process used by the person in dealing with the things he/she encounters (Blumer1969:145)."*

Even though studies have shown important correlations between racial differences in psychological outcomes from disaster events, Green (1993) stipulates in her review of mental health disparities in disaster studies, that there was a dearth of research because researchers might be 'uncomfortable'

analyzing racial differences amongst disaster victims, or that samples many times are not racially heterogeneous enough. My review of the literature, some 27 years later, brings me to a similar conclusion. Although there have been more studies that analyze the ways in which disaster informs mental health outcomes (e.g. Rhodes, Chan, Paxson, Rouse, Waters & Fussell 2010), research where race and sex are central to the formation of our understanding of this social problem is limited.

A theory's explanatory power may be reduced when an intersectional framework is not used to understand health disparity. For example, Kessler et al. (2006) found that there was a higher estimated prevalence of serious mental illness, 6.1 percent before versus 11.3 percent after Katrina, but their analyses focused on all Katrina survivors- they analyzed race and sex separately and discussion of racial mental health outcomes was extremely limited. This leaves us with very little information about how prevalent suicidality and mental health issues were for Black people (and Black women more specifically)- who were primarily displaced by the hurricane. Additionally, they found that individuals were more likely to have mild–moderate mental illness, 9.7 percent before versus 19.9 percent after Katrina, and the researchers found that the prevalence of suicidality was lower than expected, but we are left wondering for which groups- Blacks or Whites, or even more specifically, how Katrina exposure affected mental illness and suicidality for

Black women or Black men as well as White women or White men, differently.

Overall, there is limited research specifically on how psychological impacts emanating from disasters are informed by race and ethnicity, and there is a dearth of research on these processes by race and gender. One study, where race and class were a central part of the researcher's analysis, found that social class and race contributed to residents' psychological reactions to disasters (Aptekar 1990). [11] In research concerned with fear associated with earthquakes, Goltz et al. (1992) determined that the threat of earthquakes was associated with least amount of fear in Whites and Asians, and the highest levels of fear in those with low socioeconomic status, low educational levels, as well as women and Hispanics. Studies have found that there is a correlation between a lack of control or personal self-efficacy during storm and related natural disaster events which led to feelings of helplessness and even hopelessness (Foa, Stein and McFarlane 2006).

[11] Perry and Perry's (1959) article examined differences in children's emotions after tornadoes ravished their towns and found that Black children fared better than White children after they survived these disasters in Mississippi. It was presumed that the Black children's extended support (and kinship networks) in addition to their immediate family was a mitigating factor. Interestingly, this study also found that religiosity played a role in attitudes toward the Vicksburg tornado because virtually all fatalities due to the storm were Black. This challenged their view of God's colorblindness towards race.

Some studies have found that Blacks and Latinos reported the highest levels of emotional injury after disastrous weather events (Fothergill, Maestes and Darlington 1999). Family and extended kinship networks appear to be a mitigating factor in the recovery of Blacks, but not as much for Whites who have experienced environmental disaster events (Lowe, Chan and Rhodes 2010). Bolin and Klenow (1988) also found that family has less of a positive effect on mental health recovery for White survivors, but was more positively associated with the mental health recovery of Black survivors.

Mental Health Resilience

Research by Raker, Lowe, Arcaya, Johnson, Rhodes and Waters 2019 found that long-term mental health outcomes improved over time. More specifically, they found that Katrina survivors were resilient and that rates of both Post-traumatic stress symptoms (PTSS) and psychological distress (PD) improved over time. PTSS declined to 16.7 percent after 12 years and because, but because this was still a high percentage, they highly encourage mental health recovery efforts to be put in place for disaster survivors. They also found that PD has more deleterious effects on survivors, never returning to pre-hurricane levels during the time this study was conducted, with Blacks having the highest levels. Because this study did not use an intersectional framework, we do not know if this varied by race/sex groupings (e.g. did Black women have higher rates of PD when compared to White women or Black men?). If a respondent's home was damaged and/ or they had a family member killed in

the storm, this also did not significantly predict long term co-occurring PTSS and PD. Their "divergent findings" are likely explained by their consideration of pre-disaster wellbeing when other studies did not account for this factor. Another concern about this study is that they used a racially homogenous sample, to explore mental health outcomes. Then, they found that sociodemographic characteristics were statistically unrelated to continuing negative mental health outcomes, post disaster, but race was the exception. Considering both race and gender, in a racially heterogeneous sample, might have increased the epistemological usefulness of this study.

Mapping the Intersections of Mental Health Disparities

> *"Knowledge is a vitally important part of the social relations of domination and resistance. By objectifying African-American women and recasting our experiences to serve the interests of elite White men, much of the Eurocentric masculinist worldview fosters Black women's subordination. But placing Black women's experiences at the center of analysis offers fresh insights on the prevailing concepts, paradigms, and epistemologies of this worldview and on its feminist and Afrocentric critiques (Collins 2000:221)."*

Intersectionality- Race & Gender

Intersectionality is the study of how oppression, discrimination and marginalization affects groups in society differently based on their location within the matrix of domination (Collins 2000) or in contrast the ability to monopolize and restrict access to *power*. This critical race-feminist theoretical framework (or heuristic device) was first articulated by Kimberlé Crenshaw (1989) and has gained momentum through its use in sociological research that critically analyzes the production and reproduction of dominant-subordinate social relations. In the quote above on the Matrix of Domination, Collins (2000) brings attention to the ways in which knowledge can be unintentionally or intentionally used to maintain unequal or imbalanced power relations, and theorizes that by shifting the lens or scope of the research to one that places the marginalized from the periphery to the center of analysis, may enable us as researchers to illuminate the complex health outcomes exacerbated by social stratification and inequality.

The next logical question may be: what makes intersectionality so useful for this analysis of how disaster and race and sex inform mental health disparities for Black women? To respond, when intersectionality is applied to research that focuses on or is shaped by unequal race, sex and or class relations, it can be used as a methodological device to unpack "the relationships among multiple dimensions and modalities of social relationships and subject formations" (McCall 2005:1771). This theoretical approach will be extremely

useful in this analysis of mental health disparities since it is argued here that these disparities are presumably directly shaped and informed by both race and gender. Disasters have different ecological outcomes due to natural variations within the Earth, which geologists, oceanographers and meteorologists deem important enough to study, and intersectionality will help us to draw attention to the multiplicative or compounded spheres of discrimination and oppression that exacerbate disparities in mental health outcomes.

How does acute (e.g. Katrina) or chronic stress (e.g. racism) negatively affect mental health outcomes? According to Seeman, Merkin, Karlamangla, Koretz, & Seeman (2014), the key to understanding how this process works is by understanding cortisol. When people are exposed to acutely or chronically stressful social conditions, the body produces high cortisol (a glucocorticoid or steroid hormone) levels. Two adrenal glands located on top of each kidney produce cortisol which is a byproduct of cholesterol (Dandona & Bandyopadhyay 2004). Because of a parasympathetic nervous system reaction, cortisol inhibits insulin production in an attempt to prevent glucose from being stored, so that the body can have an immediate source of usable energy for its 'fight or flight' reaction (Dandona & Bandyopadhyay 2004).

Stress studies have been categorized in two ways. Primary mediators are the first category, and they are comprised of substances found in the body that are released by its organs in response to stressful events (like Hurricane Katrina).

These stress hormones include norepinephrine, epinephrine, cortisol, and dehydroepiandrosterone sulfate (DHEA-S) (Bicanic et al. 2003). The effects that result from the actions of the primary mediators lead to effects on the second category of the physical effects resulting from stress. For example, elevated systolic and diastolic blood pressures, cholesterol levels, glycated hemoglobin levels, and waist-to-hip ratio may increase as a result of increases to the primary mediators. According to Geronimus et al. (2006) allostatic load has been operationalized using algorithms that contain measurements of both primary mediators and secondary effects. Researchers often use a dichotomous scale with associated risks assessed and summed to produce a total allostatic load score.

Dandona and Bandyopadhyay (2004), found that cortisol narrows the arteries and epinephrine increases heart rate, both of which force blood to pump harder and faster. If the stressor is removed, then hormone levels return to normal, but in the case of those who have low social status, they are thought to be perpetually stressed and their bodies are pumping out cortisol almost constantly, which may lead to negative mental health outcomes. This whole-body process, mediated by hormones and the immune system, identifies cortisol as one of key contributors to one's allostatic load (Seeman, Karlamangla Koretz, & Seeman 2014, Elenkov & Chrousos 1999).

Moreover, studies on the effects of perceived discrimination, for example, provide evidence that this psychosocial stressor is inversely related to poor mental health outcomes (Bratter 2011; Brydon et al. 2004; McEwen & Gianaros 2010; Strike & Steptoe 2004). Research has shown that Black women have higher cortisol levels, an increased propensity towards insulin resistance, an increased likelihood of being overweight, and are more likely to be diagnosed with depression (Pyke 2010; Chambers et al. 2004). They may suffer these health problems, because as most researchers postulate, people with relatively high levels of internalized racism, have correspondingly high levels of stress, which is believed to be related to the physiological pathways associated with chronic illness (Adam & Epel 2007; Adler & Rehkopf 2008; Lapsley, Nikora & Black 2002; Epel et al. 2001; McEwen & Stellar 1993).

Age

In addition to metal health disparities exacerbated by racial and gender inequality, emotional well-being, according to the World Health Organization (2012), is a growing concern for an aging world population. Research has shown that depression and other mental health problems can be debilitating for even the most resilient people, regardless of age (Adeola 2009; Aneshensel 2009; Lowe et al. 2015; Schaefer, Kornienko, and Fox 2011). But, age can exacerbate the detrimental effects of depression. For example, the World Health Organization (2012) reported that about 6.6 percent of the elderly suffer from neuropsychiatric disorders that can lead to permanent disability (DALY's) and even death (e.g. suicide). For adults aged 60 and over, it is

estimated by the WHO, that about 15 percent of this population have been diagnosed with a mental health problem disorder. Further cofounding this issue, in primary care settings, mental health problems and depression are both underdiagnosed and undertreated (Alexopoulos 2005; Gotlib et al. 1995; Huffman et al. 2013; Kokanovic, Bendelow, and Philip 2013; Mitchell, Vaze, and Rao 2009).

Research has overwhelmingly found that depression and other mental health problems are frequently overlooked and undertreated because they coincide with other physical health problems (Siu et al. 2016; Alexopoulos et al. 2011; Cuijpers et al. 2008; Fiske, Wetherell, and Gatz 2009; Gustavson et al. 2016; Mackin et al. 2014). Additionally, medical professionals and researchers also found that the elderly who exhibit depressive symptoms are more likely to have decreased functioning when compared to the elderly who suffer from chronic medical conditions like emotional problems or depression (Alexopoulos 2005; Bisschop et al. 2004; Huang et al. 2010; Moussavi et al. 2007).

Ultimately, depression has deleterious effects that extend beyond the individual- there are increased associations between depression and poor health outcomes for the aging, as well as increased health care costs (Mitchell et al. 2009; Moussavi and Chatterji 2007). Overall, age is an important factor when analyzing disease outcomes, but past research has not shown depression

to be caused by aging (though it may be associated with aging). Instead, the process of aging may be associated with the diagnosis of other neuropsychiatric disorders (Alzheimer's and Dementia) not investigated in this research.

Hypotheses

H1: Black women will have the highest incidence of emotional problem diagnosis by race and gender.

H2: Black women will have the highest incidence of depression diagnosis by race and gender.

H3: Following Hurricane Katrina, Black women will have the highest incidence of emotional problem diagnosis by race and sex when comparing post-Hurricane Katrina versus pre-Hurricane Katrina rates.

H4: Following Hurricane Katrina, Black women will have the highest incidence of depression diagnosis by race and sex when comparing post-Hurricane Katrina versus pre-Hurricane Katrina rates.

Hurricane Katrina led to elevated incidence of physical health problems among those who were fortunate enough to survive this tragedy, but more so for racial and sex minorities who are ascribed with low social status (Brunkard, Namulanda and Ratard 2008; Groen and Polivka 2008; Seeman, Karlamangla, Koretz, & Seeman 2014).Therefore, the Black women residents of New Orleans will be more likely to be disproportionately negatively

affected by the acute stress of the hurricane event since they were also presumably living with the chronic stress of racism, sexism and classism (Groen and Polivka 2008; Seeman, Karlamangla, Koretz, & Seeman 2014).

Using this line of reasoning, this research proposes that there should be an increase in the incidence of racial disparities in the mental health problem diagnoses post-Katrina, when compared with the incidence of depression and mental health problem diagnoses pre-Katrina. This proposition aligns with Status Syndrome Theory, which would contend that because Black women are presumed to suffer the chronic stress of racism, sexism, and classism, then the addition of the acute stress of the hurricane event would increase their likelihood of negative mental health outcomes, when compared to their White and/or Male counterparts. Status syndrome theory (Seeman, Karlamangla, Koretz, & Seeman 2014) proposes that low social status negatively impacts mental health outcomes, and helps to explain how external forces can induce illness. While, status characteristics theory (Phelan, Lucas, Ridgeway & Taylor 2013) is nomothetically useful since it can help us explain how the internalization of stigma leads to disparate mental health outcomes. This research uniquely articulates these two theories, so preference will not be given to one theory or the other. Thus, it is argued here that the external inequality that lies within the interstices of racial and sex stratification is internalized and serves to reinforce disparity by race and sex for the New Orleanians who survived Hurricane Katrina.

Outcome Variable

The hurricane most likely increased racial disparities in incidence of psychosocial stress levels for those who live within the intersections of race and gender. This leads us to our research question: did Hurricane Katrina increase racial and sex disparities in incidence of mental health problem and depression diagnoses? Using the aforementioned theoretical framework, Hurricane Katrina might have increased racial disparities in the incidence of psychosocial stress levels and rates of depression and mental health problem for Black women as status syndrome theory and status characteristics theory predict. I used two outcome variables for the preliminary analysis study, the first outcome variable was whether the individual had been diagnosed with an emotional problem, which was followed up by a second question that asked individual how old they were when the diagnoses occurred. The second question as whether the individual had been diagnosed with depression, which was followed by a second question that asked how old the individual was when they were diagnosed (if they responded affirmatively to the first question).

Data and Methods

Displaced New Orleans Residents Survey (DNORS)

In order to test the hypotheses (while using an intersectional theoretical framework), we will use data from the Displaced New Orleans Residents

Survey (DNORS). According to (Peterson, Sastry, Rendall, Ghosh-Dastidar, and Gregory 2016), the DNORS sample frame consisted of Orleans Parish, Louisiana residents (this area overlaps geospatially with the City of New Orleans). The study population consisted of families living in Orleans Parish, Louisiana, in August 2005, immediately prior to any residential dislocation caused by Hurricane Katrina. The DNORS sampled pre-Katrina dwellings after identifying pre-storm residents who lived in these dwellings between June 2009 and May 2010. Katrina survivors were interviewed if they could be found by telephone or in person while living in the Orleans Parish area. After finding the pre-Katrina residents, they were interviewed where they lived at the time of the survey. Both returning pre- Katrina New Orleans residents and former New Orleans Residents who resettled in locations outside of the city were included in the study.

DNORS provides excellent data on a sample of predominately low-income Black women's mental and physical health statuses. Not only does the DNORS allow for us to examine their health status, but also its change pre and post hurricane Katrina. More specifically, the data will be used to assess respondent's changes in physical and mental health status before and after Hurricane Katrina (which may also vary based upon social, economic or resource vulnerabilities) (Groen and Polivka 2008; Seeman, Karlamangla, Koretz, & Seeman 2014). DNORS data were used to construct pre- Katrina

and post-Katrina diagnoses differences, in which the resulting weighted percentages and unweighted numbers were compared.

The racial and sex composition of the sample is as follows: of the total 1,378 individuals, 67.3 percent were Black and 32.7 percent were White, while 53.8 percent were women and 46.2 percent were men. Specifically, 37.7 percent were Black women; 29.6 percent were Black men; 16.1 percent were White women; and 16.6 percent were White men (see Appendix Table 1.1A). Overall, 42.1 percent of individuals were between the ages of 30 and 39 years old, 39.6 percent of individuals were between the ages of 50 and 69 years old, and 18.3 percent of individuals were 70 years old or older- 81.7 percent of the Sample Are between the ages of 30 and 69 years old (see Appendix Table 1.1D).

In consideration of the relationship between mental health diagnoses and age, it is important to note that a higher percentage of Blacks were between the ages of 30 and 49 years old when compared to their White counterparts. Of people aged 30 to 49 years old, there was a significantly ($p<.05$) higher percentage of Blacks in this category when compared to Whites (59.9 percent as opposed to 40.1 percent respectively) (see appendix Table 1.1C). More specifically, 37.7 percent of individuals between the ages of 30 and 49 years old were Black women, and 22.2 percent of individuals between the ages of 30 and 49 years old were Black men. Whereas, 21.3 percent of individuals

between the ages of 30 and 49 years old were White women, and 18.8 percent of individuals between the ages of 30 and 49 years old were White men (see appendix Table 1.1C).

Methods

DNORS data provides year of diagnosis for self-reported mental health diagnosis outcomes for adult residents (aged 30+) of pre-Katrina New Orleans residents, even though it is not panel data. First, year of diagnosis data is used to estimate annual hazards of being diagnosed in a given year, which is then followed by a logistic regression analysis, which was discussed in detail in Chapter 1.

Preceding the multivariate analyses of emotional problem and depression diagnosis by race and sex, annual hazard estimates of being diagnosed in a particular year were found. These findings are particularly useful since they provide time of diagnosis information that is essential to illuminate the effect that Hurricane Katrina had on the mental health outcomes of individuals. The annual hazard was found by taking the Prob (mental health diagnosis in year x | no diagnosis of the condition before year x).

To conduct the logistic regression, mental health diagnoses (emotional problem or depression diagnoses) were used to select a referent category. To select the referent category, Sample A was constructed out of those who were diagnosed between 2005-2009/10 (post-Katrina) and were 30 years old and older, to be

compared to those who had not been diagnosed before 2005-2009/10. Then, Sample B was constructed out of those who were diagnosed between 1999-2004 (pre-Katrina) and were 36 years old and older, to be compared to those who had not been diagnosed before 1999-2004. The 1999-2004 referent category was used because it is an equidistant time period preceding the 2005-2009/10 post-Katrina timeframe.

The first model is the test of overall race-sex difference in being diagnosed with either hypertension or diabetes for hypotheses one and two, and the second model or the difference between No Diagnoses and 1999-2004 Diagnoses as well as No Diagnoses and 2005-2009/10 diagnoses categories, controlling for sociodemographic variables, produce the test of hypotheses three and four (descriptions of the sociodemographic variables may be found in Chapter 1). It is important to note that a general limitation of the 1999-2004 "control group" exists because there are fewer diagnosis events in Sample A (1999-2004). This causes wider confidence intervals for Sample A (1999-2004) when compared to Sample B (2005-2009/10) (see Appendix Table 4.1). Next, in order to create income quintiles, we used equivalized household income (Burkhauser, Smeeding, and Merz 1996:385). To equivalize income, income was divided by the square root of the number of members in the household ($EI=I/\sqrt{HHS}$). This is a useful approach since in a single-person household equivalized income would equal household income and conversely equivalized income is expected to decrease as household size

increases. Lastly, equivalized income was then divided into quartiles for the analyses.

All data analysis was performed using the statistical software- STATA.

Results

Univariate Descriptive Statistics of Emotional Problem and Depression Diagnosis for Samples A and B

Emotional Problem Univariate Descriptive Statistics

Table 4.1 provides weighted univariate descriptive statistics for mental health problems: emotional problem(s) and depression. The population represented by Sample A consists of individuals aged 30 and older and 36 and older for Sample B. The race and sex composition of the population represented by Sample A is as follows: Black women represent 29.6 percent, Black men 33.2 percent, White women 16.4 percent, and White men 20.8 percent of this population. Sample B is comprised of the following race and sex distribution: Black women represent 28.0 percent, Black men 33.8 percent, White women 16.2 percent, and White men 22.0 percent of this population. Education was divided into the following categories: less than 12 years of education (less than a high education diploma), 12 years of education (a high education diploma or GED), 13 to 15 years of education (some college or an Associate's degree), and more than 16 years of education (a Bachelor's degree or higher).

In both Samples A and B, populations were highly educated- 38.6 percent reported more than 16 years of education in Sample A and 36.4 percent of individuals reported more than 16 years of education in Sample B. In Sample A, the mean population age was 51.7 years old, and in Sample B the mean population age was 49.5 years old. In the population represented by Sample A, an estimated 37.5 percent of individuals were married, and an estimated 62.5 percent of individuals were not married. In the population represented by Sample B, an estimated 39.9 percent of individuals were married, and 60.1 percent of individuals were not married. In the populations represented by

Table 4.1 New Orleans Adults Ages 30+ at the end of five-year periods immediately before and immediately after Hurricane Katrina, Weighted Statistics

	Emoional Problem Univariate Descriptive Statistics[a]		% Diagnosed with Emotional Problems in the period		F-Test 2005-2009/10 vs. 1999-2004	Depression Univariate Descriptive Statistics[a]		% Diagnosed with Depression in the period		F-Test 2005-2009/10 vs. 1999-2004
	2005-2009/10	1999-2004	2005-2009/10	1999-2004	P-Value	2005-2009/10	1999-2004	2005-2009/10	1999-2004	P-Value
All			9.4	6.1	0.042			7.8	2.8	<.001
Race-Gender										
Black women	29.6	28.0	14.2	7.7		29.7	28.4	10.3	3.3	
Black men	33.2	33.8	5.8	4.4		32.3	33.2	4.7	3.4	
White women	16.4	16.2	11.8	8.1		17.1	16.5	7.1	2.0	
White men	20.8	22.0	6.2	5.3		20.9	21.9	9.4	1.8	
Education[c]										
<12 years	14.4	15.6	8.8	8.0		14.8	15.6	7.5	1.8	
=12 years	22.6	23.9	9.3	5.4		22.1	23.8	7.5	4.6	
13-15 years	24.4	24.1	8.6	5.4		24.1	24.3	10.5	3.7	
>16 years	38.6	36.4	10.3	6.2		39.0	36.3	6.3	1.4	
Age (mean[d])	51.7	49.5				51.9	49.1			
Equivalized Household Income Quintile[ef]										
First	20.0	20.0	10.8	11.8		20.0	20.0	10.3	5.0	
Second	20.0	20.0	13.2	2.6		20.0	20.0	13.2	4.7	
Third	20.0	20.0	5.3	2.3		20.0	20.0	3.3	0.8	
Fourth	20.0	20.0	8.7	8.5		20.0	20.0	8.3	1.3	
Fifth	20.0	20.0	9.3	6.0		20.0	20.0	4.7	2.3	
Marital Status[c]										
Married	37.5	39.9	8.1	4.7		37.4	39.6	4.9	2.0	
Unmarried	62.5	60.1	10.1	7.0		62.6	60.4	9.5	3.3	
Religiosity[c]										
Not religious	7.3	7.8	9.2	2.6		7.0	7.9	10.4	6.1	
Religious	59.2	57.6	9.0	5.1		58.7	57.8	6.0	2.5	
Very religious	33.5	34.6	10.3	8.7		34.3	34.3	10.4	2.5	
Sample N	979	845	961	828		1,016	883	998	866	

Notes:

a. Percentage distribution unless otherwise noted

b. Among those not diagnosed with condition at start of 5-year period

c. Observed at 2009/10 survey

d. For 1999-2004, Age = Age in 2009/10 - 6 years

e. Emotional Problem Income Referent groups. Referent group: first (lowest) quintile.

2005-2009/10 Diagnosis: 1(0-13,000), 2(13,229-23,094), 3(23,255-37,477), 4(37,500-63,509), 5(63,640-300,000).

1999-2004 Diagnosis: 1(0-12,728), 2(13,000- 24,000), 3(24,042-38,184), 4(38,682- 64,000), 5(65,000-300,000).

f. Depression Income Referent groups. Referent group: first (lowest) quintile.

2005-2009/10 Diagnosis: 1(0-13,000), 2(13,229 23,094), 3(23,255-37,477), 4(37,500-63,509), 5(63,640-300,000).

1999-2004 Diagnosis: 1(0-12,728), 2(13,000-24,000), 3(24,042-38,184), 4(38,682-64,000), 5(65,000-300,000).

Source:

2009/10 Displaced New Orleans Residents Survey of those who were living in the City of New Orleans in 2005 just before Katrina struck.

both Samples A and B, it is estimated that the vast majority of individuals were religious, 59.2 percent in Sample A and 57.6 percent in Sample B. In the population represented by Sample A, 33.5 percent of individuals reported being very religious, and in the population represented by Sample B, 34.6 percent of individuals also estimates indicated being very religious.

Depression Univariate Descriptive Statistics

The race and sex composition of the population represented by Sample A is as follows: Black women represent 29.7 percent, Black men 32.3 percent, White women 17.1 percent, and White men 20.8 percent of the population. The population represented by Sample B is comprised of the following race and sex distribution: Black women represent 28.4 percent, Black men 33.2 percent, White women 16.5 percent, and White men 21.9 percent of the population. In both populations represented by Samples A and B, individuals were highly educated. It is estimated that 39.0 percent earned 16+ years of education in the population represented by Sample A, and 36.3 percent of the population represented by Sample B earned 16+ years of education. The estimated mean age for the population represented by Sample A was 51.9 years, and the mean age for the population represented by Sample B was 49.1 years. For individuals diagnosed with depression in the population represented by Sample A, estimates indicate that 37.4 percent were married, and 62.6 percent of individuals were not married. In the population represented by Sample B,

39.6 percent were married, and 60.4 percent of individuals were not married. In both populations represented by Samples A and B, estimates indicate individuals were religious, 58.7 percent in Sample A and 57.8 percent in Sample B. In the population represented by Sample A, 34.3 percent of individuals indicated being very religious, and in the population represented b Sample B, 34.3 percent of individuals also indicated being very religious.

Bivariate Analyses of Emotional Problem and Depression Diagnosis by Samples A and B

Emotional Problem Bivariate Analyses

Table 4.1 provides initial results for F-tests of the diagnoses of mental health problems (e.g. emotional problem and depression) for all individuals by pre/post-Katrina diagnosis. An F-test revealed statistically significant difference in diagnosis ($p<.05$) for all individuals between the two time periods, when the 9.4 percent of those diagnosed with emotional problem between 2005 and 2009/10 were compared to the 6.1 percent diagnosed between 1999 and 2004. For the population represented by Sample A, 10.3 percent of those who were diagnosed had 16+ years of education and for the population represented by Sample B, the highest percentage of those who were diagnosed had less than 12 years of education with 8.0 percent of the population, respectively. Marriage was not evenly distributed amongst categories, 8.1 percent of the population represented by Sample A and 4.7 percent of the population represented by Sample B were married, while 10.1

percent of the population represented by Sample A and 7.0 percent of the population represented by Sample B were not married. 9.2 percent of the population represented by Sample A and 2.6 percent of the population represented by Sample B estimates indicated individuals were not religious, 9.0 percent of the population represented by Sample A and 5.1 percent of the population represented by Sample B estimates indicated individuals were religious, while 10.3 percent of the population represented by Sample A and 8.7 percent of the population represented by Sample B estimates indicated individuals were very religious.

Depression Bivariate Analyses

The F-test for depression (Table 3.1) also revealed a statistically significant difference ($p<.001$) in diagnosis for all individuals between the two time periods, when the 7.8 percent of those diagnosed with depression between 2005 and 2009/10 were compared to the 2.8 percent diagnosed between 1999 and 2004, of the 998 and 866 individuals, respectively. In the population represented by Sample A, 10.5 percent of individuals diagnosed between 2005 through 2009/10 earned 13-15 years of education, while only 3.7 percent of individuals diagnosed between 1999 to 2004, estimates indicated the same years of education. 13.2 percent of individuals in the population represented by Sample A and 4.7 percent of individuals in the population represented by Sample B were in the second household income quintile. Regarding marital status, 4.9 percent of the population represented by Sample A and 2.0 percent

of the population represented by Sample B were married, while 9.5 percent of the population represented by Sample A and 3.3 percent of the population represented by Sample B were not married. In terms of religiosity 10.4 percent of the population represented by Sample A and 6.1 percent of the population represented by Sample B's estimates indicated individuals were not religious, while 6.0 percent of the population represented by Sample A and 2.5 percent of the population represented by Sample B's estimates indicated individuals were religious, and 10.4 percent of the population represented by Sample A and 2.5 percent of the population represented by Sample B's estimates indicated individuals were very religious.

Annual Hazard Analyses of Emotional Problem and Depression Year of Diagnosis

Emotional Problem- Yearly Hazard of Diagnosis

The annual hazard for emotional problem diagnoses increased, over time, for all race and sex groups as evidenced by the annual hazard graph located in Figure 4.2A. The visual inspective indicates that the annual hazard for emotional problem diagnosis sharply increased post-Katrina for all individuals. After analyzing the annual hazard by race and gender, a race/sex pattern emerged. Immediately following Hurricane Katrina, a striking increase in reported emotional problem diagnosis by sex was found. Black and White women's rates appear much higher than those for Black and White men. Then, around 2008[12], the annual hazard for Black women diagnosed with an

[12] DNORS survey months were between June 2009 and May 2010, so hazard analyses were produced to 2008 since this is the last full year of diagnosis history.

Figure 4.2A: Annual Hazard of Being Diagnosed with an Emotional Problem, All Persons Aged 30+

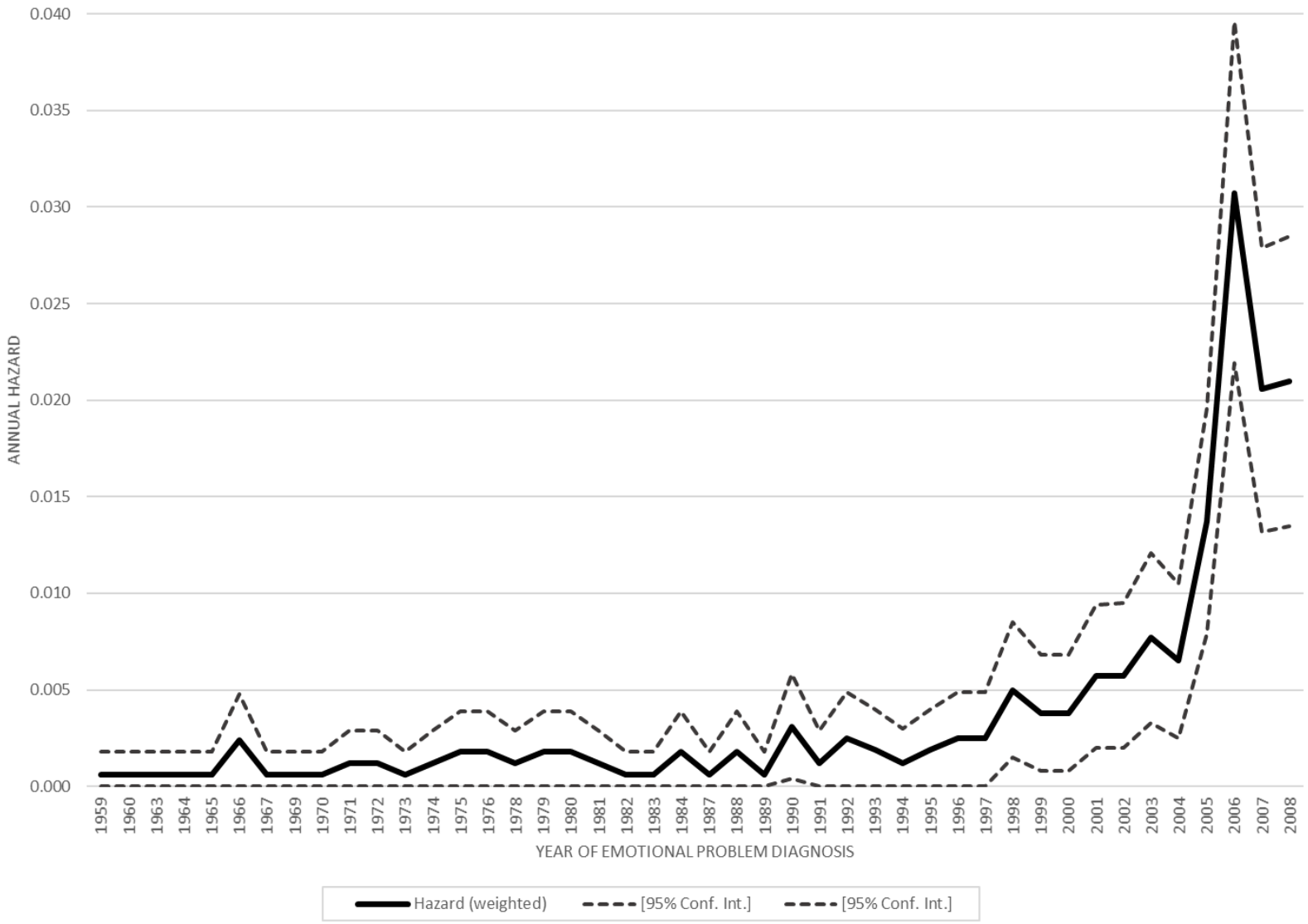
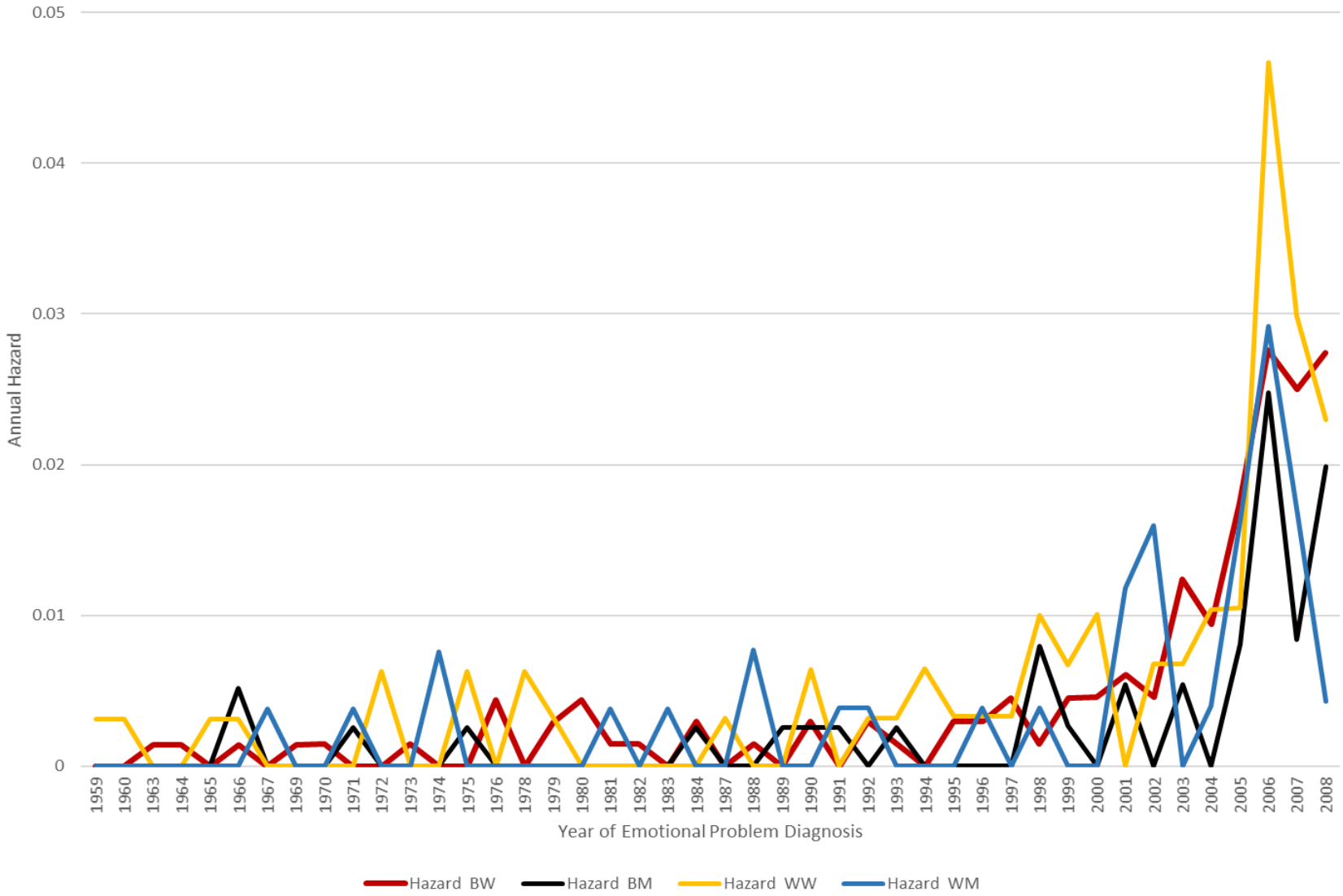


Figure 4.2B: Annual Hazard of Being Diagnosed with an Emotional Problem, by Race/Sex Aged 30+



emotional problem increased more than any other emotional problem diagnosis race and sex group in 2008 (see Figure 4.2B). Black and White men's annual hazard rose sharply, but remained consistently lower than the diagnosis rates for Black and White women.

Depression- Yearly Hazard of Diagnosis

Annualized hazards were produced for all DNORS individuals and reflect increases following the year of Hurricane Katrina (2005). This "Katrina effect" can be found in those who were diagnosed with depression (see Figure 4.2C). Per a visual inspection, the annual hazard picks up post-Katrina and decreases somewhat (never to pre-Katrina annual rates) and then increases again. Following a review of the annual hazards by race and gender, the annual hazard for depression diagnosis increased substantially over time for Black women. The annual hazard of depression diagnosis for Black women steadily increased until 2008 (see Figure 4.2D). It appears as though there is a gender gap for both Blacks and Whites from viewing the hazards. Black men generally have lower hazards than Black women and White men generally have lower hazards than White women. High racial and sex status appears to be a protective factor for when Black women had an increase in the annual hazard for depression diagnosis, Whites and men did not. Their annual hazard for depression diagnosis did not increase nearly as much over time. Overall, the clearest pattern is of large increases from the pre-2005 levels for all four

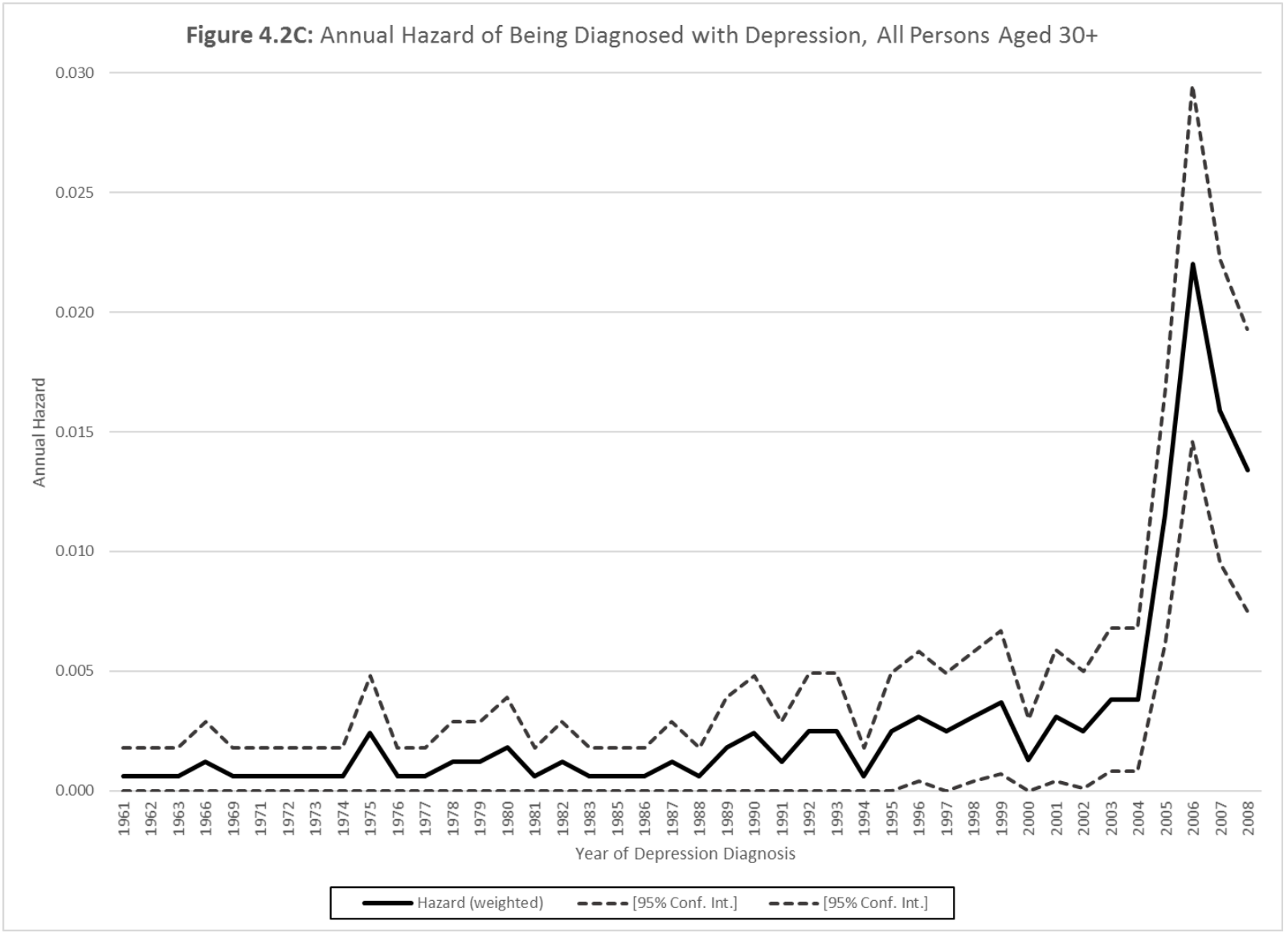


Figure 4.2C: Annual Hazard of Being Diagnosed with Depression, All Persons Aged 30+
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Annual Hazard
1961 1962 1963 1966 1969 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008
Year of Depression Diagnosis
Hazard (weighted)
[95% Conf. Int.]
[95% Conf. Int.]

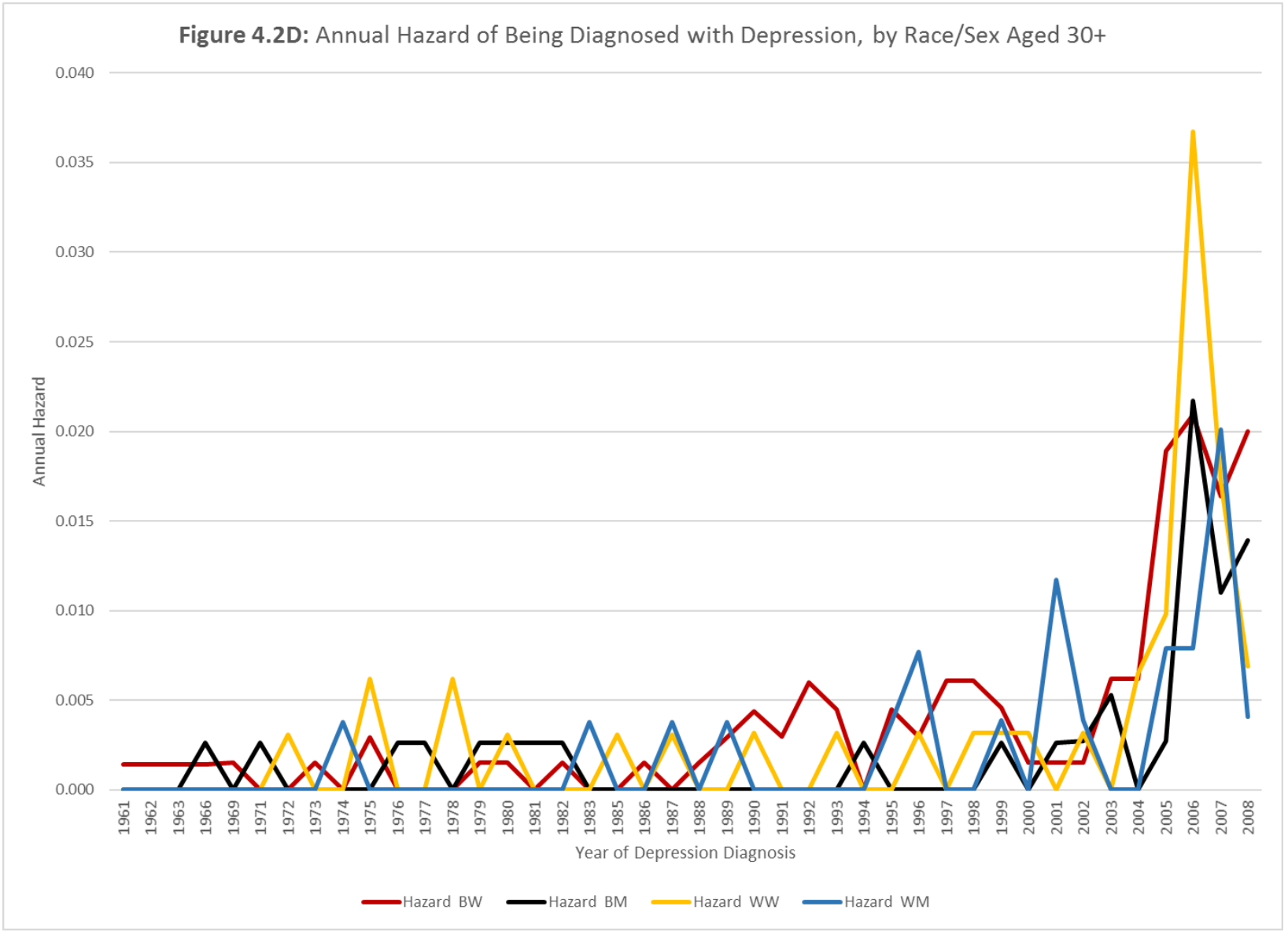


Figure 4.2D: Annual Hazard of Being Diagnosed with Depression, by Race/Sex Aged 30+
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Annual Hazard
1961 1962 1963 1966 1969 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008
Year of Depression Diagnosis
Hazard BW
Hazard BM
Hazard WW
Hazard WM

race-gender groups, and this finding is consistent with results from the multivariate analyses.

Multivariate Analyses: Logistic Regressions Predicting Emotional Problem and Depression Time of Diagnosis

Emotional Problem Time of Diagnosis

Sample A: Diagnosed 2005-2009/10 vs. No Diagnosis (Age 30+)

The logistic regression analyses for emotional problem diagnosis indicated statistically significant results and provided odds ratios (OR) that reflect disparity in diagnosis. Model 1 (Table 4.3A) is an unadjusted analysis of time of emotional problem diagnosis of the population represented by Sample A which indicates statistically significant results primarily by race and gender. Diagnoses for emotional problem appear to primarily be gendered, with masculinity being a protective factor. For example, the odds of emotional problem diagnosis in Black men are 62.7 percent lower than for Black women. While the odds of being diagnosed for White men are 60.0 percent lower than odds of diagnosis for Black women. In the fully adjusted model (Table 4.3 A-Model 2), results again indicate that masculinity is a protective factor since Black men had a 60.8 percent decreased odds and White men had a 59.8 percent decreased odds, when compared to Black women diagnosed with emotional problem diagnosis even after controlling for sociodemographic variables like education, age, income, marital status, and religiosity. Age is

Table 4.3A. Logistic Regression for Emotional Problem: Sample A (30+) No Diagnosis vs. (1999-2004) and Pre-Katrina Diagnosis and Sample B (36+) No Diagnosis versus (2005-2009/10) Post-Katrina Diagnosis (Weighted)

Variables	Sample A (30+) (No Diagnosis vs. Diagnosed 2005-2009/10)				Sample B (No Diagnosis vs. Diagnosed 1999-2004 (36+)			
	Model 1[c]		Model 2[d]		Model 3[c]		Model 4[d]	
	OR[a]	CI[a]	OR[a]	CI[a]	OR[a]	CI[a]	OR[a]	CI[a]
Race/Sex (Ref=Black Women)								
Black Men	0.373**	(0.190 - 0.733)	0.392**	(0.201 - 0.766)	0.554	(0.188 - 1.625)	0.465	(0.160 - 1.354)
White Women	0.805	(0.396 - 1.639)	0.862	(0.402 - 1.847)	1.057	(0.418 - 2.670)	1.846	(0.652 - 5.229)
White Men	0.400*	(0.199 - 0.806)	0.402*	(0.185 - 0.876)	0.678	(0.200 - 2.300)	0.880	(0.254 - 3.047)
Age			0.983*	(0.968 - 0.998)			0.956**	(0.927 - 0.987)
Education (Years) (Ref=<12 years)								
= 12 years			1.262	(0.488 - 3.263)			0.851	(0.196 - 3.694)
13-15 years			0.942	(0.389 - 2.282)			0.712	(0.206 - 2.459)
16+ years			1.313	(0.540 - 3.189)			0.641	(0.181 - 2.269)
Income (Ref=First)[b]								
Second			1.117	(0.461 - 2.707)			0.212**	(0.0703 - 0.638)
Third			0.422	(0.149 - 1.198)			0.168**	(0.0480 - 0.588)
Fourth			0.808	(0.321 - 2.038)			0.728	(0.229 - 2.310)
Fifth			0.882	(0.353 - 2.204)			0.581	(0.187 - 1.805)
Marital Status (Ref=Married)			1.103	(0.696 - 1.750)			1.508	(0.638 - 3.564)
Religiosity (Ref=Not Religious)								
Religious			0.868	(0.350 - 2.155)			1.987	(0.425 - 9.294)
Very Religious			0.995	(0.382 - 2.591)			5.014+	(0.903 - 27.84)
Sample (N)	979		961		845		828	

(*** p<0.001, ** p<0.01, * p<0.05, + p<0.1)

Notes: The unit of analysis for the findings in Table 4.3A is the individual respondent.

a. 95% confidence intervals in brackets. Odds Ratio (OR)

Multinomial Logistic Regression model (weighted)

b. Income is Equivalized Household Income, see Table 4.1 for quintile cut points.

c. Unadjusted logistic regression by race and sex

d. Adjusted regression by race and sex and sociodemographic characteristics

Source:

2009/10 Displaced New Orleans Residents Survey

also a protective factor against diagnosis, for every year increase in age, there is a 1.7 percent decrease in the odds of diagnoses.

Sample B: Diagnosed 1999-2004 vs. No Diagnosis (Age 36+)

Again, the weighted logistic regression analyses for emotional problem diagnosis indicated no statistically significant results but provided odds ratios (OR) that reflect diagnosis disparity. Model 3 (Table 4.3A) is an unadjusted analysis of time of emotional problem diagnosis of Sample B which yields no statistically significant results. White women's odds of diagnosis when compared to Black women were increased by 5.7 percent. Though not statistically significant, both Black (-44.6 percent) and White men (-32.2 percent) had decreased odds of being diagnosed with emotional problem when compared to Black women. In the fully adjusted model (Table 4.3A- Model 4), after controlling for sociodemographic variables like age, education, income, marital status, and religiosity, no statistically significant results by race and gender are evidenced. Though not significantly different, White women have 84.6 percent increased odds of diagnosis when compared to Black women diagnosed during this time, while men have comparably decreased odds of diagnosis. Again, increased age is a protective factor against diagnosis in this model, for every year increase in age there is a 4.4 percent decrease in the odds of diagnoses. Individuals who indicate that they are in the second or third income quintiles have significantly increased odds of diagnosis when compared to those in the first income quintile. Those in the second

income quintile have 78.8 percent decreased odds of diagnosis, and individuals in the third income quintile have 83.2 percent decreased odds of diagnosis when compared to those in the first income quintile. Individuals indicating that they were very religious had 401.4 percent higher odds of being diagnosed with an emotional problem.

Depression Time of Diagnosis

Sample A: Diagnosed 2005-2009/10 vs. No Diagnosis (Age 30+)

Model 1 is an unadjusted analysis of time of depression diagnosis by race and gender. This analysis revealed that gender is correlated with diagnosis. Black men (-57.2 percent) have significantly reduced odds of diagnosis when compared to Black women who were diagnosed during this time period. No statistically significant differences were found between Black women and either White women or men (see Table 4.3B-Model 1). In the fully adjusted model (see table 4.3B- Model 2), when compared to those in the first income quintile, odds of diagnosis for the third income quintile decreased by 72.3 percent, and those in the fifth income quintile had 61.8 percent decreased odds of depression diagnosis.

Table 4.3B Logistic Regression for Depression: Sample A (30+) No Diagnosis vs. (1999-2004) and Pre-Katrina Diagnosis and Sample B (36+) No Diagnosis versus (2005-2009/10) Post-Katrina Diagnosis (Weighted)

Variables	Sample A (30+) (No Diagnosis vs. Diagnosed 2005-2009/10)				Sample B (No Diagnosis vs. Diagnosed 1999-2004 (36+)			
	Model 1[c]		Model 2[d]		Model 3[c]		Model 4[d]	
	OR[a]	CI[a]	OR[a]	CI[a]	OR[a]	CI[a]	OR[a]	CI[a]
Race/Sex (Ref=Black Women)								
Black Men	0.428*	(0.200 - 0.919)	0.554	(0.249 - 1.233)	1.048	(0.276 - 3.976)	1.075	(0.238 - 4.842)
White Women	0.665	(0.278 - 1.594)	1.339	(0.515 - 3.478)	0.616	(0.170 - 2.228)	0.562	(0.101 - 3.131)
White Men	0.896	(0.391 - 2.051)	1.791	(0.663 - 4.840)	0.533	(0.153 - 1.861)	0.547	(0.0805 - 3.714)
Age			0.990	(0.970 - 1.009)			0.997	(0.973 - 1.021)
Education (Years) (Ref=<12 years)								
= 12 years			1.155	(0.371 - 3.599)			4.665	(0.561 - 38.76)
13-15 years			1.574	(0.549 - 4.509)			3.800	(0.500 - 28.86)
16+ years			0.920	(0.325 - 2.606)			1.598	(0.203 - 12.57)
Income (Ref=First)[b]								
Second			1.151	(0.444 - 2.985)			0.740	(0.201 - 2.716)
Third			0.277*	(0.0830 - 0.925)			0.144*	(0.0303 - 0.684)
Fourth			0.753	(0.257 - 2.203)			0.282	(0.0348 - 2.287)
Fifth			0.382+	(0.132 - 1.101)			0.741	(0.153 - 3.579)
Marital Status (Ref=Married)			1.550	(0.884 - 2.719)			1.389	(0.384 - 5.022)
Religiosity (Ref=Not Religious)								
Religious			0.657	(0.223 - 1.932)			0.272	(0.0435 - 1.703)
Very Religious			1.332	(0.427 - 4.154)			0.272	(0.0279 - 2.651)
Observations	1,016		998		883		866	

(*** p<0.001, ** p<0.01, * p<0.05, + p<0.1)

Notes: The unit of analysis for the findings in Table 4.3B is the individual respondent.

a. 95% confidence intervals in brackets. Odds Ratio (OR)

Multinomial Logistic Regression model (weighted)

b. Income is Equivalized Household Income, see Table 4.1 for quintile cut points.

c. Unadjusted logistic regression by race and sex

d. Adjusted regression by race and sex and sociodemographic characteristics

Source:

2009/10 Displaced New Orleans Residents Survey

Sample B: Diagnosed 1999-2004 vs. No Diagnosis (Age 36+)

Results from the unadjusted model (Table 4.3B- Model 3) indicate no significant factors in depression diagnosis. Though not statistically significant, White women had 43.8 percent decreased odds of being diagnosed when compared to their Black women counterparts during this time. White men had 45.3 percent decreased odds of being diagnosed when compared to Black women during this time. In the fully adjusted model, income was a significant predictor of diagnosis. Individuals in the third income quintile had 85.6 percent reduced odds of diagnosis when compared to those in the first income quintile.

Discussion/Conclusion

Results from this study may indicate that even though Hurricane Katrina happened in 2005, its effects on mental health outcomes continued to persist to 2010. The strength of this analysis is in the comparison of mental health outcomes by race/sex groupings. This proved to be invaluable for illuminating the disparities in long-term effects of disasters on racial/sex minorities. Disparity is not a one size fit all social phenomena- though diffuse, it is not amorphous, nor is it ubiquitous. Though in research on disparity, often race is treated like a monolith. This study was designed to interrupt that logic. Black people have a range of mental health experiences, and subsequently a range of ways in which trauma is manifested, and research to date has done a poor job

of illuminating these differences with racial groups. Intersectionality is but one tool (or heuristic device) that can be used to uncover what might be hiding within an analysis on race.

Possibly over time, we may interpret findings to suggest that the trauma from these disaster events may deeply root mental health problems in the psyche of survivors, especially so for gender minorities (Weisler, Barbee, and Townsend 2006). Virtually all statistical models estimating negative mental health outcomes, emerging from Hurricane Katrina, show that severe symptoms persist in duration, remaining elevated years following the initial distress (Fussell et al. 2010; Kessler et al. 2006). This study lends some support to these findings. Though most studies are unable to determine causation in the relationship between disaster and poor mental health outcomes (Raker et al. 2019), another strength of this study is in its ability to draw from past experience (or time of diagnosis pre and post-Katrina) which is used to fill in this baseline information. Subsequently, time of diagnosis functioned to create the necessary reference point to determine the effects of disasters on mental health outcomes for our race/sex groups (Black women, Black Men, White Women, White men). This research clearly shows support for the conclusion that significant adverse mental health effects may be based in disaster related trauma.

The annual hazard findings for both emotional problem and depression diagnosis show overwhelming support for our hypothesis- that Black women will be most negatively affected by the disaster distress. When untangling race and sex using an intersectional analysis, we see that it's not just race, as in findings from Fussell et. Al. 2010 and Raker et. Al. 2019, that is the primary sociodemographic factor associated with poor mental health outcomes emanating from the storm, but it is primarily Black women who are dynamically contributing to this statistical trend. Masculinity can be said to be a protective factor somewhat shielding Black men from the disaster distress. Both Fussell et. al. 2010 and Raker et. al. 2019 found that Black individuals were more likely to have an increased risk of negative mental health outcomes immediately following the hurricane, but most disturbing these effects persisted in duration whereas their White counterparts, though initially elevated, declined or even disappeared over time.

The DNORS data is representative of the pre-Katrina New Orleans population which counterbalances this mid-sized data set. Due to some small sample sizes, there was not sufficient statistical power for the logistic regression models to show statistically significant results (see Fothergill and Peek, 2004), even though the odds ratio estimates show support for the hypotheses. This is self-reported emotional problem and depression diagnosis data which is a poor substitute for the accuracy of clinical diagnoses (see self-report validity-sensitivity analyses results from dissertation Chapter 2). Future research

should incorporate medical records to strengthen the reliability and validity of findings. Disaster victims should receive continued treatment- especially for Black women (or other marginalized racial/sex groups depending on the society) survivors (Wang et al., 2007). Climate change needs to become a central concern of disparity research. Preexisting social inequality should be mitigated and disaster resources should be directed to politically, economically, socially, and/or geographically disenfranchised groups. Disaster efforts should increase the efficiency of evacuation, and subsequent recovery efforts. Long-term mental healthcare needs to be put in place for marginalized disaster survivors.

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Chapter 5: Conclusion

This three-paper dissertation investigated both mental and physical health outcomes, by expressly using an intersectional analysis, to offer insight into the sociodemographic correlates of Hurricane Katrina Survivors' health outcomes. Using the aforementioned analytical framework, these papers were developed to answer, extremely important sociodemographic and epidemiological questions emanating from catastrophe survivors' social contexts, that have thus far received little attention. I am extremely grateful to have received the chance to discover answers to these dissertation questions, and look forward to more academic exploration of how preexisting social inequalities shape desperate health outcomes for racial/gender minority disaster survivors.

Though the first paper provides necessary background information on Hurricane Katrina and the social geography of the New Orleans area, the analyses in second paper of this dissertation was motivated by the fact that self-reports are often relied upon as the sole source of data in health outcome analyses. I wanted to examine whether or not self-reported data should be trusted- is it valid, is it reliable? Using the PSID (person years 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013), the results of this longitudinal sensitivity analysis on hypertension, diabetes and psychological distress by race and gender, suggests that there is much variance in the consistency of

responses over time. Inconsistent reports may be primarily affected by who responds to a survey, so respondent inconsistency impedes response consistency over time. Clearly, who reports these disease diagnosis results has a significant impact on the validity and reliability of self-reported hypertension, diabetes and psychological distress. Overall, validity was not affected by race and gender- instead it was other factors (income and education) that contributed to self-response heterogeneity. These findings substantiate the research completed in chapters three and four of this dissertation.

The objective of the third paper in this dissertation was to extend the physical impact stage of disaster from physical pathology, physical disorder or death to chronic illness outcomes (e.g. hypertension and diabetes). Often research has focused on immediate injuries to the physical body or mortality/morbidity rates, but this research attempts to uncover how disasters penetrate the skin, get into the body, to have lasting deleterious effects on survivors' physical health outcomes. Although, the majority of previous research did not provide an analysis of intersectional (racial and gender) disparity in physical health outcomes, this research sought to fill the gap. We found evidence that Black women have disparate odds of chronic disease diagnosis, even though all Hurricane Katrina survivors experienced increased odds of diagnosis. Continued care should be established for immediate health concerns of survivors- especially for those who are marginalized along more than one

social dimension. They should be checked for hypertension, diabetes and other chronic illness in perpetuity following the storm event.

The purpose of the fourth paper was used to increase our knowledge of the relationship between disparate mental health outcomes, and natural disasters at intersections of race and gender. Results indicate that the chronic social inequality has negative effects on mental health outcomes by race and gender. This research found some support for the hypotheses that there should be an increase in the incidence of intersectional disparities in mental health problem diagnoses (Emotional Problem and Depression)- men had lower odds of diagnosis relative to women. Per a visual inspective of annual hazard analyses, Black women were most impacted following the disaster when compared to their White and/or Male counterparts. Health disparity research should increasingly use this most helpful intersectional analytical framework to address the effects of climate change on socially vulnerable groups, and disaster resources should be concentrated accordingly.

On August 29, 2005, Hurricane Katrina became one of the most destructive hurricanes in U.S. history. It caused flooding after the levees failed, killing people, animals and destroyed infrastructure. During this research it became apparent that more detailed information on health history and hurricane distress are necessary for understanding the persistence of chronic illness following disaster distress. This will only serve to increase our understanding

of illness following acute stress events. More sociodemographic and epidemiological research is needed to illuminate sociobiological factors that fuel health disparities. Preferably, my research can be used to update demographic research and articulate surveys with medical documentation to increase the reliability and validity of these data.

It has been an honor to research mental and physical health outcomes for Hurricane Katrina Survivors for my dissertation. Even though this dissertation research has limitations, like all other research, hopefully it will positively add to the cannon of research on both intersectionality and mental and physical health disparity.

Chapter 2 Appendix-PSID Physical and Mental Health Questions

Sociodemographic Variables

Question ER13019 "1968 Family Identifier"
1968 Family Number (ID Number): *This variable is the l968 family ID number. The combination of this variable and Person Number (V30002) provides unique identification for each individual on the data file. Individuals associated with families from the Latino sample, added to the PSID in 1990 and 1992, were assigned 1968 IDs so that they, too, have unique identifiers compatible with the PSID structure for the core (SRC and Census) sample.*
Response codes: 1 - 2,930 Member of, or moved into, a family from the 1968 SRC cross-section sample; 3,001 - 3,511 Member of, or moved into, a family from the Immigrant sample added in 1997 and 1999 5,001 - 6,872 Member of, or moved into, a family from the 1968 Census sample.

Question ER13016 "Who was Respondent"
Respondent for the 1999 Interview
Response Codes: 1 Current head; 2 Wife or new wife; 3 "Wife" or new "wife"; 4 Other FU member; 7 Proxy R; not a member of this FU; 9 NA

Question ER33503 "Relation to Head 99"
1999 Relationship to Head
Note that these relationships are those to the 1997 Head for any individual whose 1999 sequence number (ER33502) is greater than 50, that is, has moved out of the FU. Thus, for example, if the 1997 Head is no longer present at the time of the 1999 interview, his or her relationship to Head is coded 10; the new 1999 Head also is coded 10. Therefore, to select current Heads, the user must select those coded 10 in thisvariable whose sequence numbers (ER33502=01).

Question ER15928 (L40/95) (F-JJ) "Race of Head"
In order to get an idea of the different races and ethnic groups that participate in the study, I would like to ask you about your background. Are you White, Black, American Indian, Aleut, Eskimo, Asian, Pacific Islander, or another race?
Response codes: 1 White; 2 Black; 3 American Indian, Aleut, Eskimo; 4 Asian, Pacific Islander; 5 Mentions Latino origin or descent; 6 Mentions color other than Black or White; 7 Other; 8 DK; and 9 NA; refused

Question ER15932 (L41) "Primary Ethnic Group"
And what is your primary ethnic group?
Response codes: 1 American; 2 Hyphenated American (e.g., African-American, Mexican-American); 3 National Origin (e.g., French, German, Dutch, Iranian, Scots-Irish); 4 Nonspecific Hispanic identify (e.g., Chicano, Latino); 5 Racial (e.g., White or Caucasian, Black); 6 Religious (e.g., Jewish,

Roman, Catholic, Baptist); 7 Other (e.g., "a mutt", "Heinz 57", "good old boy", "hillbilly"); 8 DK; and 9 NA; refused.

Question ER13010 "Age of Head"
Age of 1999 Head: This variable represents the actual age of the 1999 Head of the FU. *The minimum age is usually 18, although in rare cases a person under 18 might become Head.*
Response codes: 14 - 120 Actual age; and 999 NA; DK.

Question ER13011"Sex of Head"
Sex of 1999 Head: Response codes: 1 Male; and 2 Female.

Question ER13021 (A3) "Head Marital Status"
Are you (HEAD) married, widowed, divorced, separated, or have you never been married?
Response codes: 1 Married; 2 Never married; 3 Widowed; 4 Divorced, annulled; 5 Separated; and 8 DK.

Question ER17016 "# of children in Family Unit"
Number of Persons Now in the FU Under 18 Years of Age
This variable represents the actual number of persons currently in the FU who are neither Head nor wife/"wife" from newborns through those 17 years of age, whether or not they are actually children of the Head or Wife/"Wife."
Response codes: 0 None; and 1 - 18 Actual number.

Question ER13040 (A19) "Own/Rent or What"
Do you (or anyone else in your family living there) own the (home/apartment), pay rent, or what?
Response codes: 1 Owns or is buying home, either fully or jointly; mobile home owners who rent lots are included here; 5 Pays rent; and 8 Neither owns nor rents.

Question ER13004 "PSID State of Residence "
State of Residence.
Response codes: 1 - 51 Actual state (PSID State code); 99 DK; NA; and 0 U.S. territory or foreign country

Question ER13005 "Current State"
Current State
Response Codes: 1 - 56 Actual state (FIPS code); 99 DK; NA; and 0 Inap.: U.S. territory or foreign country.

Question ER15977 (L68) Religious Preference-Head"
What is your religious preference?

Response codes: 1 Catholic; 2 Jewish; 8 Protestant unspecified; 10 Other non-Christian: Muslim, Rastafarian, etc.; 13 Greek/Russian/Eastern Orthodox; 97 Other; 98 DK; 99 NA; refused; and 0 none; atheist; agnostic.

Question ER16462 "Total Family Income"
Total Family Money Income in YEAR
Please note, this variable can contain negative values. The negative values indicate a net loss, which in waves prior to 1994 were bottom-coded at $1. These losses occur as a result of business or farm losses. This variable is the sum of these five variables: ER16452 Taxable Income of Head and Wife/"Wife", ER16454 Transfer Income of Head and Wife/"Wife", ER16456 Taxable Income of Other Family Unit Members (OFUMs), ER16458 Transfer Income of OFUMs, and ER16460 Social Security Income.
Response codes: -999,998 - -1 Actual amount of loss; 0 No family money income in YEAR; 1 - 9,999,998; and Actual amount 9,999,999 $9,999,999 or more.

Question S417 "Imputed Wealth with Equity Measure (WEALTH2) 99"
This variable is constructed as sum of values of seven asset types (S403, S405, S409, S411, S413, S415, S419) net of debt value (S407) plus value of home equity.
Response codes: -99,999,999 Balance of - $99,999,999 or less; -99,999,998 - -1 Actual amount of negative balance; 0 Does not own any asset or home, or their net value is zero; 1 - 999,999,998 Actual amount of positive balance; 999,999,999 Balance of $999,999,999 or more.

Question ER33516 (G90) "Years Completed Education 99"
What is the highest grade or year of school that (he/she) has completed?
The values for this variable represent the actual grade of school completed; e.g., a value of 08 indicates that this individual completed the eighth grade by the time of the 1999 interview.
Response codes: 1 - 17 Highest grade or year of school completed, 98 DK, 99 NA, 0 Inap.: from Latino sample (ER30001=7001-9308); from Immigrant 2017 sample (ER30001=4001-4462); main family nonresponse by 1999 or mover-out nonresponse by 1997 (ER33501=0); in an institution in both 1997 and 1999 (ER33502=51-59 and ER33508=0); associated with a 1999 FU but actually moved out before 1998 (ER33508=5, 6, or 8 and ER33510<1998) or born or moved in after the 1999 interview (ER33501>0 and ER33502=0); not a person aged 16 or older (ER33504=001-015).

Question ER32049 "Last Known Marital Status"
Marital Status of this Individual as of Wave Specified in ER32033
This variable indicates the marital status reported for this individual as of the wave indicated in ER32033. For a detailed description of the types of people about whom marital history information was gathered, see the 1985-2017 Marriage History File, Documentation, Section I.

Response codes: 1 Married, 2 Never married, 3 Widowed, 4 Divorced, annulment, 5 Separated, 8 NA; DK, 9 No marital histories were collected for this individual in 1985-2017 (ER32033=99).

Dependent Variables

Question H5. (B) "Hypertension Diagnosis"
Has a doctor ever told you that you have or had any of the following-- b. high blood pressure or hypertension? Response codes: 1 Yes; 5 No; 0 Wild code; 8 DK; 9 NA; refused.

Question H5. (C) "Diabetes Diagnosis"
Has a doctor ever told you that you have or had any of the following--c. diabetes or high blood sugar? Response codes: 1 Yes; 5 No; 0 Wild code; 8 DK; 9 NA; refused.

Question H5. (H) "Psychiatric Diagnosis"
Has a doctor ever told you that you have or had any of the following--
h. any emotional, nervous, or psychiatric problems? Response codes: 1 Yes; 5 No; 0 Wild code; 8 DK; 9 NA; refused.

Chapter 3 Appendix-DNORS Physical Health Questions

Sociodemographic Characteristics

Question HHID. "Household ID"
The pre-Katrina household identifier is the HHID 8-digit character variable.

Question A11. "What is your current age?"
Response Codes: Integer range (18 – 120)

Question A12a. "Are you male or female?"
Response Codes: 1. Male; 5. Female

Question B2. "Did you own the home/apartment, pay rent, or what?"
Response Codes: 1. Any family member owned or was buying (fully or jointly); 2. Family paid rent; 3. Family neither owned nor paid rent; DK/RF

Question B3. "Are you now living at this same address?"
Response Codes: 1. Yes; 5. No; DK/RF

Question B4. "What is your current address?"
Response Codes: Addr1. Street number and Name; Addr2. Apt No/Rural Route/PMB; City. City;
State; Zip. ZIP code; Country

Question C31. "What Group best describes [your/NAME FROM C2's] race or ethnic origin?" Would you say White, Black or African American, Hispanic or Latino, Asian, American Indian or Alaska Native, Native Hawaiian or other Pacific Islander, or some other Group?
Response Codes: 1. White; 2. Black or African-American; 3. Hispanic or Latino; 4. Asian; 5. American Indian or Alaskan Native; 6. Native Hawaiian or other Pacific Islander; 7. Some other Group (specify); DK/RF

Question C32. "Are you currently married, living with a partner, widowed, divorced, separated, or have you never been married?"
Response Codes: 1. Now Married; 2. Now living with a partner; 3. Widowed; 4. Divorced; 5. Separated; 6. Never married; 7. If Vol: Married but living with a partner who is not spouse; DK/RF

Question C37. "Now I have some questions about your education. What is the highest degree or level of education you completed?"
Response Codes: 0. None ; 1. First grade; 2. Second grade; 3. Third grade; 4. Fourth grade; 5. Fifth grade; 6. Sixth grade; 7. Seventh grade; 8. Eighth grade; 9. Ninth grade; 10. Tenth grade;
11. Eleventh grade; 12. Twelfth grade; no high education diploma / no GED; 13. High education graduate; 14. GED; 15. Some college credit, but less than

1 year; 16. 1 or more years of college credit, no degree; 17. Associates Degree; 18. Bachelor's Degree; 19. Master's Degree (For Example: MA, MS, MEng, MBA, MEd, MSW); 20. Professional Degree beyond a Bachelor's Degree (e.g., MD, DDS, DVM, LLB, JD); 21. Doctorate Degree (e.g., PhD, EdD); DK/RF

Question C60. "Compared to your health in August 2005 before Katrina, would you say your health is better now, about the same or worse?
Response Codes: 1. Better; 2. About the same; 3. Worse

Question C75. "To what extent do you consider yourself a religious person?" Are you very religious, moderately religious, slightly religious or not religious at all?
Response Codes: 1. Very religious; 2. Moderately religious; 3. Slightly religious; 4. Not religious at all; DK/RF

Question D3. "Were you physically injured in any way as a result of Katrina?"
Response codes: 1. Yes; 5. No; DK/RF

Question D7. "As a result of Katrina, was anyone else you know injured or killed?"
Response Codes: 1. Yes, injured; 2. Yes, killed; 3. Yes, both (injured and killed); 5. No, neither; DK/RF

Question F1a. "Has a doctor or other health professional ever told you that you had… Hypertension or hypertension?"
Response Codes: 1. Yes 5. No

Question F1a1. "How old were you when you were first diagnosed with hypertension or hypertension?"
Response Codes: Integer Range (0 – 125)

Question F1b. "Has a doctor or other health professional ever told you that you had… Diabetes or High Blood Sugar?"
Response Codes: 1. Yes 5. No

Question F1b1. "How old were you when you were first diagnosed with diabetes or high blood sugar?"
Response Codes: Integer Range (0 – 125)

Question M1. "What was your total household income in during the past 12 months from all sources before taxes?" Please include your income and income of anyone else living in your household. Include income from jobs, investments, public assistance, unemployment insurance, Social Security, disability and pension funds, and all other sources.
Response Codes: Integer range $0 to $999999999; DK/RF

Chapter 3 Appendix Table

Appendix Table 3.1 Pre- Katrina versus Post. Katrina Unweighted Sample Numbers of Physical Health Diagnoses by Race and Sex for Adults Aged 30+ DNORS Respondents

Hypertension Diagnosis

Race and Gender	Sample A: Not Diagnosed 2005-2009/10	Sample A: Diagnosed 2005-2009/10	Sample A: Total	Sample B: Not Diagnosed Before 1999-2004	Sample B: Diagnosed 1999-2004	Sample B: Total
Black women	134	71	205	109	47	432
Black men	129	77	206	111	37	148
White women	142	28	170	127	16	143
White men	136	29	165	125	26	151
Total	541	205	746	472	126	598

Diabetes Diagnosis

Race and Gender	Sample A: Not Diagnosed 2005-2009/10	Sample A: Diagnosed 2005-2009/10	Sample A: Total	Sample B: Not Diagnosed Before 1999-2004	Sample B: Diagnosed 1999-2004	Sample B: Total
Black women	266	36	302	234	23	257
Black men	244	33	277	224	20	244
White women	188	7	195	172	4	176
White men	196	11	207	185	2	187
Total	894	87	981	815	49	864

Notes:

Sample A respondents were restricted to those age 30 and older, and Sample B respondents were restricted to those 36 and older in 2009/10, so that all respondents were at aleast 25 years old at the beginning of their respective diagnosis period.

Unweighted sample sizes unless otherwise noted

Among those not diagnosed with condition at start of 5-year period

Observed at 2009/10 survey

Source:

2009/10 Displaced New Orleans Residents Survey of those who were living in the City of New Orleans in 2005 just before Katrina struck.

Chapter 4 Appendix-DNORS Mental Health Questions

Sociodemographic Characteristics

Question HHID. "Household ID"
The pre-Katrina household identifier is the HHID 8-digit character variable.

Question A11. "What is your current age?"
Response Codes: Integer range (18 – 120)

Question A12a. "Are you male or female?"
Response Codes: 1. Male; 5. Female

Question B2. "Did you own the home/apartment, pay rent, or what?"
Response Codes: 1. Any family member owned or was buying (fully or jointly); 2. Family paid rent; 3. Family neither owned nor paid rent; DK/RF

Question B3. "Are you now living at this same address?"
Response Codes: 1. Yes; 5. No; DK/RF

Question B4. "What is your current address?"
Response Codes: Addr1. Street number and Name; Addr2. Apt No/Rural Route/PMB; City. City;
State; Zip. ZIP code; Country

Question C31. "What group best describes [your/NAME FROM C2's] race or ethnic origin?" *Would you say White, Black or African American, Hispanic or Latino, Asian, American Indian or Alaska Native, Native Hawaiian or other Pacific Islander, or some other group?*
Response Codes: 1. White; 2. Black or African-American; 3. Hispanic or Latino; 4. Asian; 5. American Indian or Alaskan Native; 6. Native Hawaiian or other Pacific Islander; 7. Some other group (specify); DK/RF

Question C32. "Are you currently married, living with a partner, widowed, divorced, separated, or have you never been married?"
Response Codes: 1. Now Married; 2. Now living with a partner; 3. Widowed; 4. Divorced; 5. Separated; 6. Never married; 7. If Vol: Married but living with a partner who is not spouse; DK/RF

Question C37. "Now I have some questions about your education. What is the highest degree or level of school you completed?"
Response Codes: 0. None ; 1. First grade; 2. Second grade; 3. Third grade; 4. Fourth grade; 5. Fifth grade; 6. Sixth grade; 7. Seventh grade; 8. Eighth grade; 9. Ninth grade; 10. Tenth grade;
11. Eleventh grade; 12. Twelfth grade; no high school diploma / no GED; 13. High school graduate; 14. GED; 15. Some college credit, but less than 1 year; 16. 1 or more years of college credit, no degree; 17. Associates Degree; 18.

Bachelor's Degree; 19. Master's Degree (For Example: MA, MS, MEng, MBA, MEd, MSW); 20. Professional Degree beyond a Bachelor's Degree (e.g., MD, DDS, DVM, LLB, JD); 21. Doctorate Degree (e.g., PhD, EdD); DK/RF

Question C60. "Compared to your health in August 2005 before Katrina, would you say your health is better now, about the same or worse?
Response Codes: 1. Better; 2. About the same; 3. Worse

Question C75. "To what extent do you consider yourself a religious person?"
Are you very religious, moderately religious, slightly religious or not religious at all?
Response Codes: 1. Very religious; 2. Moderately religious; 3. Slightly religious; 4. Not religious at all; DK/RF

Question D3. "Were you physically injured in any way as a result of Katrina?"
Response codes: 1. Yes; 5. No; DK/RF

Question D7. "As a result of Katrina, was anyone else you know injured or killed?"
Response Codes: 1. Yes, injured; 2. Yes, killed; 3. Yes, both (injured and killed); 5. No, neither; DK/RF

Question F1h. "Has a doctor or other health professional ever told you that you had: any emotional, nervous, or psychiatric problems?"
Response Codes: 1. Yes 5. No

Question F1h1. "How old were you when you were first diagnosed?"
Response Codes: Integer Range (0 – 125)

Question F1n. "Has a doctor or other health professional ever told you that you had: major depression?"
Response Codes: 1. Yes 5. No

Question F1n1. "How old were you when you were first diagnosed with major depression?"
Response Codes: Integer Range (0 – 125)

Question M1. "What was your total household income in during the past 12 months from all sources before taxes?" *Please include your income and income of anyone else living in your household. Include income from jobs, investments, public assistance, unemployment insurance, Social Security, disability and pension funds, and all other sources.*
Response Codes: Integer range $0 to $999999999; DK/RF

Chapter 4 Appendix Table

Appendix Table 4.1 Pre- Katrina versus Post. Katrina Unweighted Sample Numbers of Mental Health Diagnoses by Race and Sex for Adults Aged 30+ DNORS Respondents

Emotional Problem Diagnosis

Race and Gender	Sample A			Sample B		
	Not Diagnosed 2005-2009/10	Diagnosed 2005-2009/10	Total	Not Diagnosed Before 1999-2004	Diagnosed 1999-2004	Total
Black women	258	48	306	234	15	249
Black men	273	25	298	252	8	260
White women	159	21	180	147	13	160
White men	179	16	195	168	8	176
Total	869	110	979	801	44	845

Depression Diagnosis

Race and Gender	Sample A			Sample B		
	Not Diagnosed 2005-2009/10	Diagnosed 2005-2009/10	Total	Not Diagnosed Before 1999-2004	Diagnosed 1999-2004	Total
Black women	282	35	317	255	8	263
Black men	280	21	301	259	4	263
White women	182	13	195	170	5	175
White men	188	15	203	177	5	182
Total	932	84	1,016	861	22	883

Notes:

Sample A respondents were restricted to those age 30 and older, and Sample B respondents were restricted to

Unweighted sample sizes unless otherwise noted

Among those not diagnosed with condition at start of 5-year period

Observed at 2009/10 survey

Source:

2009/10 Displaced New Orleans Residents Survey of those who were living in the City of New Orleans in 2005 just before Katrina struck.

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